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THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Patents and Sportsmanship.

The question of the attitude to be adopted towards Patented process is revived in our correspondence columns by Mr. Smeeton in a letter dealing with "Perlit" cast iron. It is pointed out that Letters Patent have been granted in all countries and until they have been rescinded it is useless and perhaps a little undignified to question novelty or validity. The procedure to be followed where Patents have been granted is well established.

There are several other Patented processes for the manufacture of high duty iron, and whilst the lay mind may fail clearly to differentiate between the various processes, there must be a realisation of the fact that the officials of the Patent Office have, after careful research, satisfied themselves that differences do exist. Thus, the lay mind can rely upon such conditions until a higher judicial authority has decided otherwise.

We do not associate ourselves with those who clamour for radical changes in Patent Office procedure, because a certain amount of latitude is apparently allowed to inventors. We imagine that this ignoring of existing specifications is due to the old-established practice of asking for and obtaining "hopeful" Patents. To take a purely hypothetical case, a foundryman 50 years ago could have enunciated quite a good case for the granting to him of a patent for the manufacture by centrifugal methods of cast-iron cylindrical articles, but owing to the invention being in advance of the mechanical appliances necessary for the practical accomplishment of the process, the whole application can be placed in the category of "hopeful." Continuing this hypothesis, if when mechanical appliances are available, a man invests his time, energy and money in the practical development of the process, making, as time passes, many essential subsidiary inventions, then no real harm is done if "hopeful" applications are given, but little prominence in researches for priority.

As these questions affect everybody engaged in foundry work, we believe it would be generally advantageous if the following unwritten, yet sporting, rules were observed:—(1) Refrain from filing "hopeful" applications, except where it is thought that by such action better facilities may be given for practical experiment. (2) Honour other people's Patents in the way in which you expect your own to be treated, and bear in mind that both competitive and your Patent may on closer examination be anticipated by an almost prehistoric specification of the "hopeful" variety. (3) It should be borne in mind that in most Patent actions one, if not both, parties are fighting, not a private case but a public one, as quite often it is shown that a process is available to the public, and the monopoly finally established is one lying within very circumscribed limits. (4) If a process of a "useful" rather than "epoch-making" character is in being in any works, and the attitude taken is that whilst a Patent is not specially desired it is essential that no other firm should be granted a Patent on it and so cause an unpleasant situation, it is best to secure publication by means of a Paper to a scientific society or an article in the technical Press. For instance, a light castings foundry may make a discovery in a lifting appliance, but, being totally disinterested in the manufacture of transport apparatus, could protect themselves from any future embarrassment of Patents and usefully add to the world's knowledge by describing the improvements effected in one of the ways indicated.

XUM

Acid-resisting Bronze.

BY W. E. CORSE.*

An acid-resisting bronze with the strength of steel has been developed by the Alcumite Corporation, a division of the Duriron Co., Dayton, Ohio. Research on the aluminium bronzes has shown that the addition of iron improves both the physical properties and the resistance to acid corrosion. As one of the uses of interest to steel makers is in pickling equipment, it was decided to see what the new aluminium bronze alloy, known as alcumite, would do in that type of service.

Preliminary trials proved so satisfactory that the Company has produced, from both castings and rolled shapes, the various pieces of equipment required in pickling. These include crates, baskets, pins, racks and tank rods.

Ventilation of pickling rooms always is a difficult problem because of the corrosive nature of the fumes. Alcumite fans and ducts are proving satisfactory for that purpose. Although various kinds of ventilating systems are in use, all of them require acid-resisting material. The nearer such material approaches steel in working qualities, the easier is the job of fabrication. Fortunately alcumite can be worked as readily as steel, so that no change in equipment is necessary when changing from one material to the other.

It is interesting to note that alcumite, one of the aluminium-bronze alloys, has an average tensile strength of 75,000 lbs. per sq. in. in casting and in the hot-rolled products shows a strength as high as 100,000 lbs. The metal is ductile and readily machined, and may be formed into any of the commercial shapes.

Resistance to fatigue or alternating stress is an outstanding property of the aluminium bronzes. The particular range of compositions into which alcumite falls is about the highest of the series, so that for parts in which this property is an advantage, alcumite is most acceptable. In some cases actual service tests show a superiority to steel in this respect and a marked improvement over many other industrial bronzes.

The resistance of the bronze to corrosion is not confined to acids and chemicals, but is shown by experience to place it among the leading materials in resisting the action of sea water. Engineers are beginning to appreciate the many uses to which a strong acid-resisting bronze can be put, and recent developments indicate that many useful outlets in engineering practice will be found for such material.—"Iron Age."

Book Review.

"The Facts of Industry—The Case for Publicity." Published by MacMillan and Company, Limited, St. Martin's Street, London. Price 1s. net.

This report has been prepared by an unofficial committee consisting of employers, trade union leaders and experts in economics, accountancy and law. They are Lord Astor, Professor Bowley, Messrs. H. G. Brown, J. T. Brownlie, W. L. Hichens, Frank Hodges, W. T. Layton, Kenneth Lee, Sir McLintock, Messrs. J. J. Mallon, A. Pugh, B. Seebohm Rowntree and H. B. Usher.

The main object of the Report, as we see it, is the advocacy of the provision of statistics which will remove all doubt when industrial disputes arise as to the profits made by any industry. Thus they desire to see the early publication of balance-sheets for public inspection to which will be attached those of subsidiary concerns. If it makes for real confidence between master and man then the object sought is definitely justifyable.

PROFESSOR BRADLEY STOUGHTON, of the Metallurgical Department of Selwyn University, is at present in Europe investigating the conditions obtaining in metallurgical institutions.

* Consulting Metallurgist with Alcumite Corporation.

Foundry Costs.

According to the "Iron Age," such a large majority of the Los Angeles foundries subscribed to the fund for launching the cost instruction course that the project was definitely started on May 15. Out of approximately 60 institutions which it was hoped might become interested, 47 had signed up and several more had indicated their intention to sign.

The course will be under the direction of John E. Hax, who has had 20 years of experience in studying foundry overhead and is said to be competent to place the industry upon a profitable basis. Recently he has completed successfully a similar course among the foundries in San Francisco.

It is not the plan to hold classes of instruction, but Mr. Hax will visit each foundry in turn, will investigate its working conditions, its facilities and its accounting system, if any. After studying the individual problem he will make such suggestions as he thinks will result in converting its operations from the old haphazard method into one which will ensure profitable operation.

No attempt will be made to effect a uniform scale of prices. All he will attempt to do will be to introduce a uniform method of estimating costs, to introduce an effective system of accounting and to attempt to show each individual foundryman how he can operate his plant, whatever his facilities may be, profitably for himself without derangement to the industry as a whole.

Philadelphia Foundrymen's Association.

Mr. Walter Wood, head of R. D. Wood & Company, Philadelphia, cast-iron pipe manufacturers, was elected President of the Philadelphia Foundrymen's Association at its annual meeting, June 9. Mr. Wood had been Chairman of the Executive Committee of the Association for 35 years. Mr. Oliver Smalley, who was at one time connected with the Close Foundry, Gateshead, gave an illustrated address on foundry practice.

Micro-Photographs as Publicity.

Keighley Laboratories, Limited, of South Street, Keighley, have prepared a series of micro-photographs of a composite character. They are of post-card size and the reverse sets out the service given in connection with each. The four we have received relate to malleable iron; case hardening; cast iron; and the metallurgical microscope.

Foundry Queries.

Rapidly-setting Oil Sand Core Mixtures.

Will you please let me know of a mixture of oil, suitable for intricate sea-sand cores, that will quickly stiffen up before being transferred to the stove, as the cost of the proprietary core oils precludes their general use.—G. L. H.

Moulding Lamp Columns.

The above subject being of particular interest to the writer, a detailed description of an economical and tried method of moulding ordinary street-lamp columns would be appreciated.—A. R. B.

Mr. Charles P. Markham, chairman of the Staveley Coal & Iron Company, Limited, died suddenly on Tuesday at his residence, Ringwood Hall, near Chesterfield.

WE regret to report that Mr. W. H. Poole, the director of the Keighley Laboratories, who was taken ill during the recent convention in London, has to undergo a surgical operation. The functioning of the laboratory, however, will not be interfered with, as a competent staff is available for its conduct.

INSTITUTE OF BRITISH FOUNDRYMEN.

TWENTY-THIRD ANNUAL CONVENTION.

(*Continued from page* 480.)

WEDNESDAY, JUNE 16.

At the conclusion of the first session of the Convention, and on the motion of the President, a very hearty vote of thanks was accorded the authors of the three Papers discussed.

Luncheon.

The officers of the Institute and the Reception Committee were entertained to luncheon on Wednesday at the Royal Agricultural Hall by Messrs. F. W. Bridges & Sons (Organisers of the Exhibition). Mr. V. C. Faulkner (Chairman of the Foundry Trades' Equipment and Supplies Association) was in the chair.

The Loyal Toast having been duly honoured,

CAPTAIN R. B. CREWDSON (Deputy Chairman and Joint Managing Director, Industrial Newspapers, Limited) proposed "The Institute of British Foundrymen." Speaking as one who had recently become connected with the Institute for the first time, he said it seemed to him that there were three things which indicated that it was playing its part in the industrial and scientific progress of this country, and playing it really well. In the first place, the country was faced with a grave industrial dispute, and it seemed to him that, instead of bemoaning their fate and looking at things in a dejected frame of mind, the foundrymen were doing their very best to use the time by improving their great industry, by studying its technicalities and thereby advancing it. The fact that at such a time the Exhibition could have been organised, and that everyone had been ready to seek out everything that might help to improve the industry, was a sure sign of how deeply and truly the Institute entered into the well-being of the industry, and of how truly everybody was working to keep the British foundry trade foremost in the world. In the second place, he had been very greatly impressed with the international aspect of the Institute. It was a very great thing that the Institute did not remain insular in outlook. Although the practice of exchanging Papers with the foundry industries of this and other countries had been established only five years ago, he understood that already sixty Papers had been exchanged, and that those Papers, written by experts in France, Belgium, America and this country, had been very much valued and appreciated. Thirdly, the fact that the objects of the Institute were technical and social, and not political nor commercial, was a very important thing; it was a great achievement that, after an existence of 23 years, its aims should still be technical and social. He was very greatly impressed, in a humble way, as a student of industry, with the ideals of the Institute, to pool the knowledge of all engaged in the trade—which, after all, was one of the greatest corner stones of British industry—for the benefit of British industry. Dealing with the establishment of the Institute, he said that it resulted from some anonymous correspondence published in THE FOUNDRY TRADE JOURNAL 23 years ago, and that the man who had written the first letter was a Past-President, Mr. "Jimmie" Ellis. (Mr. Ellis, who was present at luncheon, was greeted with loud applause.) In that period of 23 years the Institute had accomplished something which many industries were still striving to accomplish, but could not; it had accomplished a feeling of goodwill throughout the industry, not only in this country, but abroad, a feeling which made for peace in the industry and, therefore, for its betterment. It was, therefore, with humility—because this was the first time he had been able to meet its members—with admiration for what it had done in the past, and with best wishes for its future success, that he proposed the toast of "The Institution of British Foundrymen."

MR. JOHN CAMERON (Past-President), responding, commented that for the first time in his experience the members had been addressed by two gentlemen (Mr. Arthur Henderson and Capt. Crewdson), in the course of one day, who had really appreciated what the Institute stood for. Dealing with international relationships, he said that the Institute had just received an invitation to attend the international gathering to be held at Barcelona in 1928. Mr. Cameron emphasised the value of these international meetings, and expressed regret that so few from this country would be able to attend the International Congress at Detroit this year. In urging the members to take advantage as much as possible of opportunities to visit other countries, he assured them that those visits were not only enjoyable, but also most instructive. Discussing further the aims of the Institute, he said how very much he had been impressed by the breaking down of the old jealousies which had existed between one firm and another in the trade before the Institute was established; the activities of the Institute had been responsible for that, and founders were now able to meet together, compare notes and talk over their difficulties, to the benefit of all. They also encouraged their staffs and workmen to do so, and it was a pleasure to him to be associated with a body so democratic in its basis as the Institute of British Foundrymen. Finally, he said he came before the members that day with a clear conscience, and believed that he had handed over the Institute to Mr. Faulkner in a very healthy condition. He did not think that at any time had there been so much good fellowship, so much serious work and so much real endeavour to get to the bottom of things as at present. There was a feeling in the country that it was now becoming almost a necessity for a firm to be connected with the Institute. As the result of a little missionary expedition to Middlesbrough last year a branch had been formed there; it was in a very healthy condition numerically and in enthusiasm, and he felt sure that before long Middlesbrough would provide the Institute with a worthy President.

COMMANDER L. JACKSON (Past-President, Sheffield Branch) proposed "The Chairman." Mr. Faulkner, he said, was President of the Foundry Trades' Equipment and Supplies Association as well as President of the Institute, and all the members looked upon him with a great deal of feeling and affection. He assured Mr. Faulkner that he could depend in the future upon the loyalty which the members of the Institute had always extended to their Presidents in the past.

The toast was received with musical honours.

THE CHAIRMAN, in a brief response, said he was not present in his capacity as President of the Institute, but was acting on behalf of Messrs. F. W. Bridges & Sons, who were the hosts. Therefore he proposed a toast to the success of the Exhibition, coupling with it the name of Messrs. Bridges.

MR. K. W. BRIDGES briefly responded.

Official Visit to the Exhibition.

In the afternoon the members and delegates visited officially the Exhibition, and were entertained to tea by Messrs. Bridges.

The Institute Banquet.

The Institute banquet was held in the Grand Hall at the Hotel Cecil on Wednesday evening, The President (Mr. V. C. Faulkner) was in the chair, and there were present some 200 members and visitors, many of the latter from overseas. The company included the Rt. Hon. Sir Alfred Mond, Bart., P.C., M.P.; Sir William Larke, K.B.E. (Director, National Federation of Iron and Steel Manufacturers); Mr. F. W. and Mr. K. W. Bridges (Messrs. F. W. Bridges & Sons, organisers of the International Foundry Trades' Exhibition), Mr. John Cameron, J.P. (Past-President), and Mrs. Cameron; Mr. F. J. Cook (Past-President); Mrs. V. C. Faulkner, Mr. J. T.

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Goodwin (Vice-President) and Mrs. Goodwin; Mr. Barrington Hooper, C.B.E., Mr. Wesley Lambert and Mrs. Lambert; Monsieur G. Masson (President, Belgian Foundrymen's Association); Brig.-Gen. F. E. Metcalfe, C.B., C.M.G., D.S.O.; Mr. R. O. Patterson (Past-President); Mr. J. G. Pearce (Director, British Cast Iron Research Association); Mr. Geo. C. Pierce (President, London Branch); Sir John Prestige; Sir Berkeley Sheffield, Bart., M.P.; Monsieur E. Ronceray (Vice-President, French Foundrymen's Association); Mr. S. H. Russell (Vice-President); Mr. J. Ellis (Past-President); Mr. Oliver Stubbs (Past-President); Capt. R. B. Crewdson; and Mr. H. G. Sommerfield (Hon. Convention Secretary).

The Loyal Toast having been duly honoured,

THE RT. HON. SIR ALFRED MOND, Bart., P.C., M.P., proposed "The Institute of British Foundrymen." The Institute, he said, had been in existence for some years; in fact, it had come of age. It had reached the age of 22 years, an age at which we all believed that youth was the only thing that mattered, and when the things we could not tolerate were old age and experience. As one who thoroughly believed in the great

MONSIEUR LEON THOMAS.

M. Thomas, who has recently been elected president of the Association Technique de Fonderie (France), is one of the outstanding figures in French foundry life. After having a wide experience in the direction of foundries in France, Switzerland and Germany, he has for some years managed the Citroën foundries in Paris. He is also a member of two German foundry associations. He was an original member of the French Foundrymen's Association.

advantage of being young, he considered that a young Institute was likely to be vigorous and progressive. Its objects were excellent, its membership was magnificent, and he was perfectly certain that the work which it would do, both nationally and internationally, would be of the greatest importance. After all, founding was a very respected and aged science; it took us back to the days when the casting of church bells was one of the principal occupations of the founder. Some of those bells still emitted tones of such beauty that he doubted whether, with all the modern science we had created, we could equal the mixtures which the old-time founders so empirically created. To-day the foundry history had become more varied and more important to the progress of the world than at any other period. After all, if anything was distinguishing us from our forefathers, it was the fact that we were living in an age of mechanical progress, above all, mechanical progress so rapid that greater and greater demands were being made daily upon all forms of technical execution. The engineer to-day called for consistency of performance, and demanded the fulfilment of conditions which were almost incredible many years ago. It was very interesting to look back over industry, especially chemical industry, and to reflect upon the evolution of processes which to-day were becoming commonplace—the processes of synthesis under high pressure and high temperature, which called for castings of steel, as he himself had said recently at his Billingham works, giving most remarkable performances, and which were a triumph of British workmanship. It was interesting to think how many of those things were possible now but were never attempted in former times because the technical means were not available; the machinery for their production was non-existent. He had looked back at the history of Messrs. Brunner, Mond & Company's chemical works, and had recently looked at an old engine which had been working for forty years, and was still working—a tribute to those who built it. He remembered, as a child, the difficulties his father had in getting compressing machinery of a type which would cause one to smile if it were suggested to-day.

Demand for Special Alloys.

Again, in the aeroplane industry to-day there were demands for metals which were light and

MR. ARNOLD LENZ,

who presented the American Exchange Paper.

Mr. Lenz was born May 10, 1888, in Hauingen, Germany, where he attended public school. At the age of fourteen he entered the office of the firm Sarasin, Staehelin & Company, Haagen, as an apprentice, attending a technical night school during this four-year period. In 1916 he emigrated to America, and his first two years were spent working his way through two terms at the New York State Normal School at Fredonia, N.Y. In 1908 he entered the employment of the Browning Foundry Company, Ravenna, Ohio, as a moulder helper. After mastering the rudiments as an iron moulder, he left this company for experience in brass and aluminium. After working in various jobbing foundries as moulder, coremaker, melter and foreman, he secured a position as instructor in the foundry of the Buick Motor Company, Flint, Michigan, in May, 1916, and was promoted to general foreman and Assistant Superintendent the same year. In January, 1919, he accepted a position as Assistant to the Manager of the Aluminium Casting Company, Detroit, but returned to the General Motors Corporation the following May in the capacity of Superintendent of the Grey Iron Foundry of the Saginaw Products Company, then under construction. In 1922 he became Manager of that plant, and in June, 1925, he was promoted to Assistant to General Manager of the Saginaw Products Company, in charge of the Grey Iron and Malleable Iron Foundries.

strong, for all ranges of products, for nickel-chrome steel, new aluminium alloys, etc.; new forms of alloys were springing up like mushrooms, many of which, of course, were essential factors in future progress. Foundrymen must play a very important *rôle* there, for, after all, the aero engine required very delicate and special castings, and the study and utilisation of these new materials in the foundry would undoubtedly cause new problems to be put up and solved. The little

experience he had had of foundry work and its results had left on his mind the impression that it was extremely anxious work. After the most infinite care and trouble, something went wrong; an expensive casting had a crack, the contract which looked so profitable began to appear otherwise, the works manager began to look anxious, and the sales manager began to tear his hair. It was difficult work, and to some extent metals were rebellious creatures which, in spite of the care and trouble devoted to them, did not always obey those scientific laws laid down for them. Of course, greater control of temperature and improvements on modern methods would eliminate more and more those difficulties. At the same time, it was his opinion that a good foundry foreman was sometimes worth a large number of text books. (Hear, hear.) By some uncanny method, some peculiar instinct known only to himself, he produced results upon which he could not give a scientific lecture, but which were very satisfactory.

International Ramifications.

Reverting to the Institute itself, Sir Alfred said he was very glad that it appreciated the importance of the maintenance of close contact internationally. To-day there was no monopoly in any country in the world in scientific thought or industrial progress. In fact, science had invaded the whole world, and no one could tell in what corner of the globe some new idea might emerge; no one could tell what new process might be discovered or what problems might be solved one day in Japan, another day in France, another day in Germany, another day in America, or elsewhere. It was of the greatest importance to the progress of the world that these new ideas should not remain hidden in one corner of it, and should not be monopolised, but should become the property of the world. Therefore, it was wise for us to disregard and to discourage the old-fashioned ideas and formulæ, according to which everybody had a secret carefully guarded from everybody else, just as, in the old days, somebody had a ledger which he did not understand, but which nobody else was allowed to see. After all, we gained more by an interchange of ideas with other human beings than we were likely to gain by thinking that we were the only clever people who would ever discover anything. It was international amity and progress which undoubtedly made for the development of the world. That was how those in industry to-day really conceived it. Incidentally, they liked to see, if possible, some return for their labour and their capital. There were such people as shareholders, who, having put their money into industry, most unreasonably expected some remuneration. (Laughter.) They were not often gratified; they did not seem to understand that the service they were rendering ought to satisfy them beyond all means, particularly in the engineering industries, the most difficult of all he had ever been connected with, which did not show any profits at all except upon paper before the contracts were completed. (Laughter.) For all that, however, the British engineering and foundry industries were by no means played out. He had an infinite belief in the capacities of the people, even in the middle of the most stupid coal strike from which we had ever suffered, and which was paralysing industry.

Essentials for Progress.

In spite of these occasional aberrations of otherwise reasonable people, we managed to pull through, and even if sometimes he felt we were really slow, we had a curious habit of moving rather quickly when we made up our minds to move. So long as we did not wait too long it was all right. He was certain that in modern industry, progress, concentration and co-operation were the three things required to put us where we ought to be, in the front rank. Old traditions had disadvantages, but they also had values. It was quite true that we did not hustle around and tell people we were hustling quite so much as our American cousins did; they were so busy telling us how they were hustling that we wondered when they did any work—(laughter)—but somehow we did get results slowly, and sometimes pretty surely, and he could say, speaking as one with an experience extending over many years in industry, that British engineering, inventive capacity, and the capacity to solve problems was as good as that of any other country in the world; if we obtained the right people with the right training, gave them the necessary means and opportunities, and backed them with courage and determination, we could obtain the results. We

MR. E. J. YATES, B.Sc. (Met.).

Mr. Yates was educated at Orme Boys' School, Newcastle-under-Lyme, and later took a three years' degree course at Birmingham University. Since November, 1923, he has occupied the position of Metallurgist to Goldendale Iron Company, Limited, Tunstall, near Stoke-on-Trent.

MR. M. L. BECKER, B.Met.

Mr. Becker is, with Prof. F. C. Thompson, joint author of the Paper entitled "Some Notes on the Chemistry of the Cupola." He was educated at Ilkley Grammar School and Dollar Institution. He received his metallurgical training at Sheffield University, and has spent two years in the research department of the Metropolitan Vickers Electrical Company, Limited, Manchester. He has recently been engaged in research at the University of Manchester, and is at present on the staff of the British Cast Iron Research Association. He is an associate member of the Institute of British Foundrymen and a member of the Iron and Steel Institute and Institute of Metals. Mr. Becker has contributed papers to the Iron and Steel Institute and to the Manchester Literary and Philosophical Society.

suffered more from cold feet on the part of the people at the top to-day than we suffered from the incapacity of the people who were doing the work; we wanted a little more of the old pioneer spirit exhibited by the men who created British industry.

Oil from Coal.

It was important that those directing industries should have some knowledge of the industries they were directing, and should not look upon their industries merely as money-making machines. Only a few days ago he had read of the great progress which some of our friends in Germany were making in connection with various new synthetic processes. He had no doubt that similar progress would be made in this country, and when the demand was made for new forms of apparatus, involving, as he hoped it would, orders to many foundries and engineering works in this country in vast proportions, we should not be wanting. It was interesting to reflect, for instance, upon what would be the effect upon the engineering industry of the world when we really started to make oil from coal on a large scale, when we began to convert, not a few thousand tons of coal

MR. J. H. PARTRIDGE.

Mr. J. H. Partridge was educated at King Edward's Grammar School, Birmingham, and the University of Birmingham. He obtained his B.Sc. (1st class) 1923; B.Sc. (Honours), 1st class, 1924; and M.Sc. in 1925. He has been a Carnegie Research Scholar during the last two years. He is a member of Metallurgical Research School in Birmingham University under Prof. Turner.

a day, but hundreds of thousands of tons a day, by some of these new processes. Interested as he was in an engineering works, he looked forward to a better time than had been experienced in the last few years; the iron and steel industry would once more come into its own, and that would stimulate matters all round. He was afraid he was an incurable optimist; he had no patience with those who sat down with folded arms and awaited our extinction; there was no logical reason for such expectations. Just as he believed that humanity, far from having achieved its destinies, was only now on the threshold of achievement; that locomotion would advance so that distances would disappear and countries would be practically as contiguous as suburban villas; that the resources of the world would not become exhausted; that the world would not become overcrowded—for it was obvious that the progress and development of all kinds of modern ideas with regard to fertilisers and food production would enable us to support a population so vast as to be inconceivable now; equally he was convinced that this country had before it a glorious destiny, and that those who were young to-day would see the development on a large scale of many great and new ideas, and when they grew old would be able to tell their children of the astonishing kind of cave existence which we led in 1926. The Institute of British Foundrymen would watch all these interesting developments; it would find new and fascinating subjects for its members to study and to utilise; it would find also, he hoped, new resources to turn to profitable undertakings. This picture was not the product of a visionary, but of one who had spent over a quarter of a century in the direction of some of the largest industrial concerns in this or any other country. He had seen markets lost and new ones opened up; he had seen people despondent at the thought that consumption had come to a standstill, and had seen that consumption rise year by year; he had seen people imagining that in their own processes perfection had been reached, but we were still revolutionising what we considered to be obsolete plants, and new works were as different from the old as any works could be. When one had lived through that, one was able to speak with conviction. It was in this spirit, not merely of hope, but of certainty, that he proposed the toast of "The Institute of British Foundrymen," and coupled with it the name of a young and energetic pioneer, its President.

Powdered Fuel in Foundries.

The PRESIDENT, responding, expressed his thanks for the cordial manner in which the toast had been proposed and received. In a tribute to Sir Alfred Mond, he said that at the present time there were in the Cabinet at least two students of Professor T. Turner, an esteemed Hon. Member of the Institute, and expressed the hope that in the near future it would include a third metallurgist, namely, Sir Alfred Mond. There was at present a special Bill in Parliament, and he hoped that that Bill would soon pass into law, so that Sir Alfred could fill a position which he had filled before with such great distinction. Addressing Sir William Larke, who, as the Director of the National Federation of Iron and Steel Manufacturers, is closely concerned with statistics, the President pointed to the difficulties which faced the foundry industry as the result of the absence of statistics. The industry, he said, was the key of key industries; Sir Alfred Mond could not turn out alkalies or any other products without some cast iron somewhere. Surely then, the great key of key industries should have some statistics for itself. It did not know at the moment the competition it was supposed to meet, and it did not know what it exported. The statistics relating to cast iron exports included cast-iron pipes, tubes, electrical fittings, and all sorts of things, which in truth were castings, but such statistics did not offer the industry any guidance. Unfortunately, the industry was diverse in character; the men who made gutters for the roofs of houses, or pipes used under the streets, or the engines at the generating stations, had but little in common; all they had in common at the moment was the Institute. He asked Sir William, therefore, for his help in the production of the statistics which the industry needed. Speaking of the Institute, he said that it prided itself not only upon its national but also upon its international relations. He had received that day telegrams expressing good wishes from the foundrymen's associations in America, France, Czecho-Slovakia and Spain. These associations were working for the same common object as that for which the British Institute was working, and he announced that the Institute had been invited by the Spanish Association to attend a conference in Barcelona. Finally, commenting upon Sir Alfred Mond's remarks, he said he was glad to hear him hold out the hope of obtaining oil from coal on a large scale. He himself had heard a good deal about it, but it was a little in the air at the moment. An allied problem, however, to which foundrymen would do well to devote close study, was that of the use of powdered fuel. He was pleased to hear only that morning that the largest malleable iron foundry in Great Britain had decided to use powdered fuel, and he believed that the second largest would be chasing it in an effort to be first. That, he said, was good news.

Scientific and Practical Collaboration.

MR. OLIVER STUBBS (Past-President) proposed "Scientific Institutions and Allied Industries," which, he said, included the National Physical Laboratory, the Iron and Steel Institute, the Institute of Metals, the Research Department at Woolwich, and last, but not least, the British Cast Iron Research Association. The Institute of British Foundrymen, he said, was delighted to welcome representatives of those bodies, and wished to thank them for their support in the past. At the same time, he assured them that the Institute was anxious to do all it could to help them, for the benefit of all. In a reference to the benefits which accrued from an interchange of ideas between all these bodies, he pleaded for an even greater co-ordination between the scientific and the practical aspects of the industry than perhaps had been manifest in the past. In acknowledging the valuable work carried out by the British Cast Iron Research Association and the necessity for its continuance, he said that, as the result of the splendid record of that body in the last five difficult years they had been able to put such a strong case before the Department of Scientific and Industrial Research that the latter, he believed, had practically decided to grant to the Association the terms they had asked for for another five years. (Applause.) He took pride in the fact that the Institute of British Foundrymen was the father of the Research Association. As to the Institute itself, he said it was one of the few bodies which included within its membership the men in the shops, the foremen, the managers and the employers, and emphasised that if there were more bodies through the medium of which the workpeople and those who were responsible for the control of industry could be brought so closely into contact one with the other, there would be far less trouble in the industrial world. He had every sympathy with the British worker. It was quite true, as Sir Alfred Mond had said, that we were only at the beginning of progress, and for that reason he appealed for support of the work of the Institute and other such bodies, which, it must be remembered, was carried out by men who were keen enough to devote their leisure to it.

CAPTAIN R. B. CREWDSON (Joint Managing Director, Industrial Newspapers, Limited), who responded, in the absence of Sir Joseph Petavel, F.R.S. (Director, National Physical Laboratory), said that just as the research work carried out by the various bodies mentioned was playing a more and more vital part in keeping British industry where we wished to see it, so the members of those bodies felt that they depended for their success upon the support and encouragement which they might receive from the industries they sought to serve. The eloquence with which Mr. Oliver Stubbs had proposed the toast, and the hearty manner in which it had been received, would be an encouragement to the members of those bodies and an inspiration to them in their work throughout the coming session.

MR. F. J. COOK (Past-President) proposed the toast of "The Guests," and thanked them for having honoured the Institute by their presence. The Institute, he said, was proud to welcome such men as Sir Alfred Mond, Sir William Larke, and other giants of industry who were present. It was also proud of the fact that there were also present representatives from America, France, Belgium, Sweden, Denmark, Czecho-Slovakia and Germany, and he commented with pleasure on the fact that one table was occupied entirely by representatives from Sweden, including a Past-President of the Swedish Foundrymen's Association. He extended to all the guests a very hearty welcome.

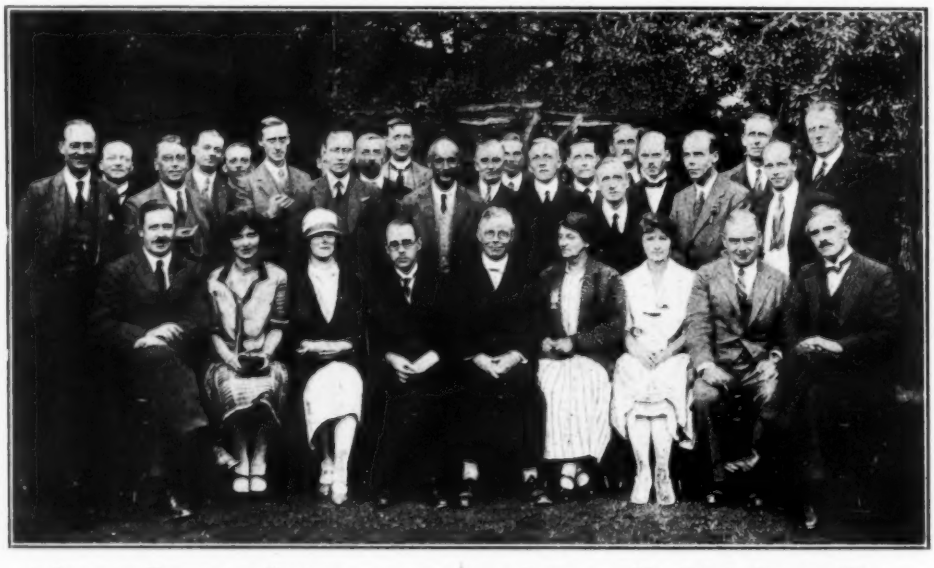
A GROUP OF VISITORS TO LETCHWORTH GARDEN CITY.

Lessons from the Coal Crisis.

SIR WILLIAM LARKE, K.B.E., responded, and thanked the Institution, on behalf of the guests, for the hospitality extended to them. He dwelt upon how much functions of this character contributed towards the welfare of the industries with which they were connected, and emphasised the value of the free exchange of information, discovery and experience between the representatives of all industries in all countries. Nothing could be gained, he said, by attempting to retain a technical monopoly, because such a monopoly could not be retained, and, if it were retainable, it was not worth retaining, because collective knowledge and experience was of far greater benefit to the individual who contributed to it than any individual contribution he himself could make. He himself had been brought up as an engineer and had been associated with industry all his life, and knew full well that the technical difficulties we all met with in our daily life, and which needed so much solving, were frequently

solved by someone else, working in another direction altogether, whose knowledge would not be conveyed to us except by the establishment of the closest possible contact and the free interchange of ideas. One of Sir William's epigrams was that the problems of 1926 cannot be solved with a 1914 mind. Like Sir Alfred Mond, he was an optimist; he was one of those who believed that a pessimist was a man who saw a difficulty in every opportunity, and that an optimist was a man who saw an opportunity in every difficulty. If that were true, what opportunities did he see in the recent emergency through which the country had passed, and the crisis with which the country was still faced? He saw the opportunity of laying the foundation of that mutual confidence between all people in this country, which would enable us to rise to that unity of thought and singleness of purpose which had characterised our efforts during the war, and that unity and confidence, when secured—as he believed it would be secured as the result of the solution of the present difficulties—would enable us to use the finest industrial capacity in the world. Those who had been privileged to see the war effort from a position which enabled them to survey the effort of the whole country, particularly those who had been trained as industrialists, knew full well—and he said it without fear of contradiction—that the industrial effort of this country during the war period was unprecedented in the world in this or any other time. Such effort would bring us prosperity in the future, and all that was needed to secure it was mutual confidence on the part of all engaged in industry, so that they worked to a common end. Dealing with the suggestion that the foundry industry had not sufficient statistics on which to base commercial policy, he said it was less than a week ago when he had first heard that there was any such need. He was delighted, however, to hear the remarks which had been made, and his efforts at least to meet that need could be relied upon. It did not rest entirely with him or his colleagues, however; there were others involved, such, for instance, as Customs officials, but so far as it was possible, the statistics which the foundry industry required would be prepared and incorporated in the national statistics, for which he was responsible, to the iron and steel industry.

MR. JOHN CAMERON, J.P. (Past-President), proposed the final toast, that of "The Convention Committee and the London Branch." An enormous amount of work was involved, he said, in recent years to make the annual gatherings of the Institute the success they had been, but on this occasion those responsible for the arrangements had come through some special difficulties with very great credit. For the first time in the history of the Institute it had been doubtful, until a comparatively short time before the Convention was to be held, whether or not it would have to be postponed. There had been difficulties arising out of reduced railway services and many other factors, but the Convention Committee and the London Branch were maintaining the high standard attained in connection with the Institute's Conventions in the last three or four years. On this occasion the Convention was more attractive than ever, because it had been arranged to have a wonderfully good exhibition running concurrently with it. As one who had been to every Exhibition since 1913, he could say that it was the finest foundry Exhibition ever seen in this country, and he congratulated the organisers, Messrs. F. W. Bridges & Sons, as well as the Convention Committee and the London Branch, upon their enterprise. No one recognised more than he the educational value of such Exhibitions; it was always his practice to send his managers and foremen to visit them, and they came back to their work encouraged and enthused with new ideas. They met old friends and made new ones, and they returned with new interest and new enthusiasm for their work, which would be impossible but for the efforts of the Institute. The members of the Convention Committee were Col. W. F. Cheesewright, D.S.O., Mr. Faulkner (the President), Mr. Wesley Lambert, Mr. H. Shillitoe, Mr. G. C. Pierce (President of the London Branch), and last, but not least, Mr. H. G. Sommerfield (Hon. Secretary of the London Branch, and Hon. Convention Secretary and Treasurer). He paid a tribute particularly to Mr. Sommerfield for the enormous amount of work he had done, and said it was a great pleasure to ask for recognition of that work. The Branch had given a good lead to the Institute in having taken a broad-minded view in such matters, and it was the desire of the Institute to recognise it. He coupled the toast with the name of Mr. G. C. Pierce (London Branch President).



A GROUP OF VISITORS TO BRAINTREE, TAKEN IN THE GARDEN OF MR. LAKE'S PRIVATE HOUSE.

MR. G. C. PIERCE, in a brief speech, expressed thanks on behalf of both the Committee and the Branch, and said they were amply repaid by the assurance that those attending the Convention had found it to be enjoyable and instructive. He also acknowledged in glowing terms the services which Mr. Sommerfield had rendered.

MR. H. G. SOMMERFIELD also responded in a speech characteristically brief. It was a pleasure to him, he said, to find so many in sympathy with the work done in connection with the Convention. That in itself had been ample recompense.

During the dinner musical selections were rendered by the Corelli Windeatt Sextette, and later a concert, under the direction of Mr. Arthur Hayes, contributed to the success of the evening.

THURSDAY, JUNE 17.

The proceedings were resumed on Thursday morning in the lecture room at the Royal Agricultural Hall.

British Cast Iron Research Association. New Grade of Membership.

MR. J. G. PEARCE (Director, British Cast Iron Research Association), at the invitation of the General Council of the Institute, outlined a new scheme regarding membership of the Research Association. There were, he said, several grades of membership. There were the ordinary members, generally manufacturing concerns; trade members, who were firms producing equipment or supplies for the industry; and associate members, comprising individuals engaged in the industry and who might like to keep in touch with the Association. The subscription for the last-mentioned grade was 30s. per annum, the privileges including the receipt of the Association's Quarterly Bulletin, and the use of the Library and Information Bureau. Quite recently the Council of the Association had adopted a new arrangement, which had been accepted by the General Council of the I.B.F., whereby members and associate members of the I.B.F. could take advantage of associate membership of the Research Association at a subscription of 20s. per annum.

Mr. Pearce also took the opportunity of correcting an impression which had got abroad some years ago, that an associate member was entitled to receive the whole of the Research Reports and other confidential reports circulated by the Association. It would be obvious, he said, that it would be impossible to provide, for a small and limited subscription, information for the receipt of which the full members paid many times that amount each year. He felt sure, however, that the service which could be given for the small sum of 20s. per annum would be more than sufficient recompense to those who subscribed. In addition to circulating to such associate members the Quarterly Bulletin—which watched the world's literature on founding, on behalf of the foundrymen of this country—and placing at their disposal the Library and Information Bureau, the Association was prepared to deal with any inquiry on behalf of an associate member for information relating to any aspect of founding practice; it would supply that information from books, trade literature and periodicals, provide translations from foreign literature, and books, pamphlets and periodicals could also be borrowed. He felt very strongly that if the possibilities of this service were more widely known, greater advantage would be taken of it. There were absolutely no restrictions with regard to borrowing. Members were always welcomed personally at the offices of the Association; also, the Association was always glad to receive correspondence and inquiries, and he hoped that at no distant date it would be able to provide even greater facilities for study at headquarters. The information service was one which was not offered by any other agency so far as he was aware; he hoped to make it the finest in the country, and quite unique in the founding industry, and while the reduced subscription meant a decided loss to the Association, since most of the associate members were already connected with the I.B.F., he felt sure that if the service were more widely known, associate membership would be increased, as he hoped would be the case. No individual was debarred from becoming a full member, and the Council would consider any application from producers of cast iron, either as proprietors of foundries or as partners in firms producing cast iron.

The meeting then proceeded with the presentation and discussion of Papers, most of which have already been reproduced.

THE COUNCIL of the Lancashire Branch of the Institute of British Foundrymen announce that the visit to the Derby works of the London, Midland and Scottish Railway, which was arranged for Saturday, June 26, has been postponed until a later date. On Saturday, July 17, the members will visit the works of Hartley & Sugden, Limited, Halifax (postponed from May 15), and on Monday, September 13, there will be a visit to the foundries of Mather & Platt, Limited, at the Salford iron works.

Continuous Annealing Furnace.

An interesting design of tunnel-type continuous annealing furnace for annealing malleable castings is described in "The Iron Age." It was recently put in commission at the works of the North-Western Malleable Iron Company, Milwaukee, U.S.A. The furnace is of the semi-muffled type, an outstanding feature being the design of the tunnel, which, instead of being built solid from the floor, is open the full length on both sides from the bottom of the sand seal to the floor level. The car tops form the bottom of the furnace. The sand seal extends the full length of the furnace on each side. The side of the furnace rests on girder and plate members extending above the floor, leaving a 14-in. open space along both sides extending down to the floor. This permits a free circulation of air under the cars, so that the wheels and bearings are exposed to the atmosphere and there is no need of water or air-cooling pipes.

In addition to providing for the circulation of air under the furnace, a pit with openings at both ends extends the length of the furnace beneath the car track. This permits access to the bottom of the cars, so that bearings or wheels can be replaced or other repairs made to the cars without shutting down or interfering in any way with the operation of the furnace. An axle can be jacked up and repairs completed before the time comes for the car to be moved along the track by the charge of another car into the furnace. The cars are well insulated and, with the air circulation beneath the furnace, it is stated that the temperature of the car bearings never exceeds 55 deg. C.

The furnace was designed for annealing 25 tons of castings per day, but its output since its operation started has averaged 28.8 net tons of good castings. Its fuel consumption has been 2,600 cub. ft. of gas per gross ton of iron. The over-all length of the furnace is 210 ft., the length of the furnace itself being 180 ft. At each end is a vestibule through which cars are charged and discharged. The height of the tunnel is 7 ft. 6 in. above the car top. The tunnel is divided into a 20-ft. preheating zone, a 75-ft. heating and soaking zone, and an 85-ft. cooling zone. The tunnel is built of firebrick and insulated brick, and is entirely enclosed in a structural steel I-beam and plate frame. The pit beneath the tunnel is 6 ft. deep and 3 ft. 6 in. wide, and has concrete walls and floor. Above the pit are 6-in. channel cross ties, at a level with the top of the track rails. The outlet flues are located near the charging end, all products of combustion passing up through a stack at that end. The cars have structural steel sub-structures with cast-iron tops and a superstructure of fire-clay blocks and insulating bricks. They are approximately 7 ft. wide, 6 ft. long and 3 ft. high. The wheels have roller bearings, the track gauge being 4 ft. 2½ in. A loaded car weighs about 22 tons, the weight of castings being about 5 tons.

The temperature at the charging door, in the pre-heating zone, is 340 deg. C. This rises to a maximum of 925 deg. in the soaking zone and at the discharge end of the cooling zone it is approximately 480 deg. The first manifold, starting at the charging end, is set for 815 deg., the second for 895 deg., and the last two each for 925 deg. Temperature controls are all located in the heating and soaking zones. Although designed for charging five cars a day, six cars are being charged in daily. Forty-eight cars are used, of which 30 are in the furnace and 18 are on the loading and unloading line. Of those in the kiln three are in the pre-heating zone, 13 in the holding zone and 14 in the cooling zone. The furnace is fired with 535 B.T.U. gas, which is compressed to 10 lbs. per sq. in., two Ingersoll-Rand compressors being installed, each with a capacity of 8,500 cub. ft. per hr. These are driven by two 15-h.p. motors so connected that either motor can drive either compressor. Air is inspirated by the pressure of the gas, making it unnecessary to supply air under pressure to aid in combustion. Another advantage claimed for the use of high-pressure gas is the ease of control, there being only gas, instead of both gas and air, to control. High-pressure gas also permits the use of smaller pipes for gas lines.

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Pearlitic Cast Iron.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—For some time both critical and hostile articles relating to the Lanz perlit iron process and patents, which are the property of this Company, have appeared in the technical Press.

As the majority of these letters and articles

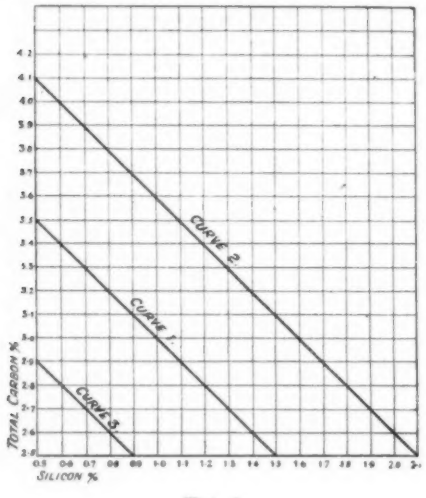


FIG. 1.

have been either unsigned or have been written by persons who have not officially or otherwise investigated our process, I have not considered it necessary to take them seriously. You have, however, printed in your April 29 edition of your paper an article by Mr. J. E. Hurst, who is, I believe, the managing director of Centrifugal

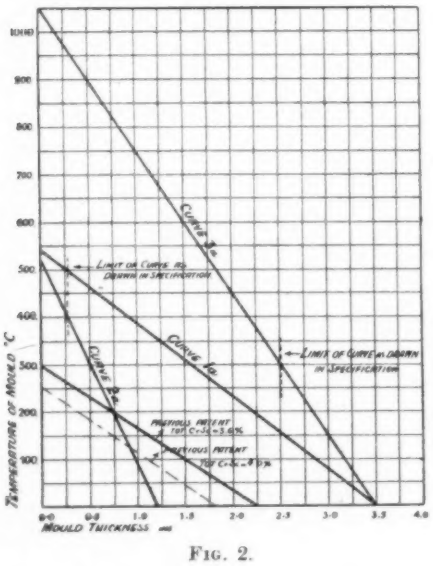


FIG. 2.

Castings, Limited, and is also, I understand, a metallurgist of some repute, but to whom we have not supplied any official information or test-pieces, and whose criticisms are therefore purely of a theoretical nature without any practical basis.

The article in question is so entirely misleading, so untrue in all its findings, that I have no alternative but to ask you to publish my reply as herewith in detail. I do this in the interests, not only of our patented process, but of all the existing and future licensees of the process throughout the world.

In order to make clear the following criticism, Figs. 1 and 2, as made by Mr. Hurst, are reproduced, and shown against the actual curves, drawn to same scale (Figs. 3 and 4), of the Patent Specification No. 210,091.

COMPOSITION CURVES.

In Fig. 1 Mr. Hurst extrapolates Curve 2 in a manner entirely unwarranted, and with entire disregard of the Patent Specification (No. 210,091, p. 1, line 76, *et seq.*), which reads:—

"The upper limit for the soft composition according to present knowledge as regards carrying out the process, is 4.6 per cent. for the carbon and silicon, the carbon being 3.5 per cent. at the

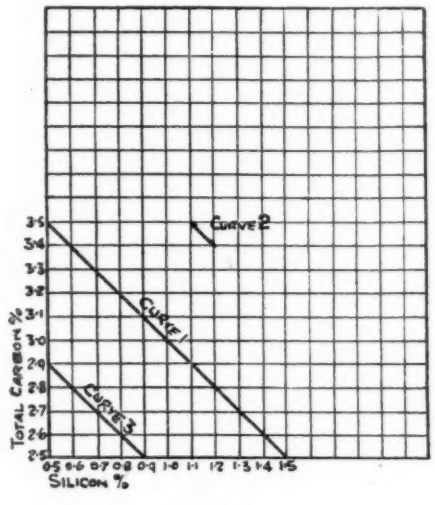


FIG. 3.

most and the silicon 1.2 per cent. at the most, etc., etc."

Hence it is obviously incorrect for Mr. Hurst to extend this curve both ways so as to include, on the one hand, iron containing 4.1 per cent. carbon and, on the other hand, iron containing

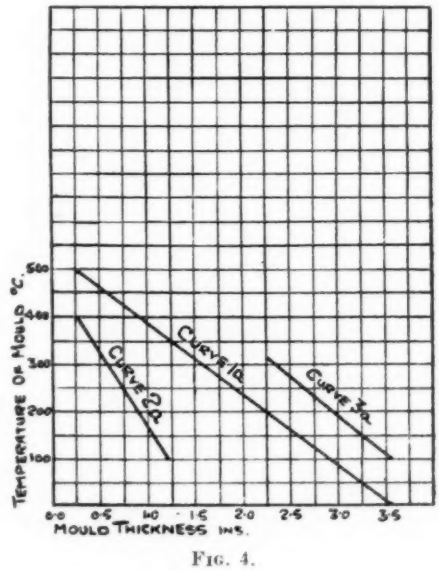


FIG. 4.

2.1 per cent. silicon. The limits of the curve are as shown in Fig. 3, Curve 2.

MOULD TEMPERATURE CURVES.

In Fig. 2 Mr. Hurst purports to show the curves taken from the Patent Specifications, with extrapolation of certain of them. It was most important, to say the least, that in the first place he should have reproduced these curves accurately and correctly. A comparison between Fig. 2 (Mr. Hurst's curves) and Fig. 4 (Specification curves) shows at a glance that Mr. Hurst's reproduction of Curves 2A and 3A is entirely wrong, apart altogether from the question of extrapolation.

Mr. Hurst proceeds to take an example of a particular thickness of castings and the various compositions of metal with which it might be cast. He writes that "According to the Perlit Process, all these varying compositions will be accompanied by the same result (*i.e.*, the pearlitic structure) when cast under these conditions. The obvious absurdity of this is shown when we consider the following facts deduced from the curves, etc., etc." From what has been said, the "obvious absurdity" is that Mr. Hurst's conclusions are based on incorrectly drawn curves and unwarranted extrapolation of Curve 2, Fig. 1.

Influence of Mould Temperature.

In the opinion of the writer Mr. Hurst's long discussion on the manner in which a casting cools is spoiled by his admission that the case of cast iron cast in sand moulds is actually different from the cases upon which he bases his arguments. By means of these arguments Mr. Hurst endeavours to prove that the rate of variation of the rate of cooling from the outside edges inwards towards the centre of the mass is unaffected by the increase in mould temperature, and that consequently the grain size varies from the outside edge to the centre in hot mould iron, exactly as it does in cold mould iron. *That this conclusion is wrong is demonstrated in actual daily practice.* Castings are produced showing generally no variation in grain size from the outside to the centre, or in extreme cases astonishingly little as compared with the ordinary process.

The Effect of Hot Mould on Strength.

Mr. Hurst states that "We may at once conclude that the larger crystal grains of the hot mould iron will not be accompanied by higher strength values or higher impact values." This statement is made by one who has not had practical experience of the Perlit Process. The facts are directly the opposite, and, from his own experience, the writer can plainly state that Perlit iron *has a higher impact strength than any other cast iron which he has examined.*

Mr. Hurst also states that "There will exist a difference in the mechanical properties, such as the tensile strength and impact values, across the section of a mass of cast iron in spite of the uniform pearlitic structure."

This statement is again the result of theoretical consideration and one which is proved incorrect by practical experience. In Mr. H. J. Young's recent Paper before the West of Scotland Iron and Steel Institute are given some results demonstrating this point.

Relation between Mould Temperature and Composition.

Mr. Hurst states that "In the above consideration of the influence of mould temperature on the structure . . . it is assumed that the chemical composition remains constant. In actual fact it is probably true that when a hot mould is used the composition of the iron used is different from what would be used in the case of a cold mould iron." It is not a question of being "probably true" that different composition is used for Perlit work—*it is essential to use a different one.*

Mr. Hurst proceeds to say that "It is not the hot mould that is responsible for uniform pearlite but the chemical composition." This statement is an unreasonable deduction both from the facts and also from his own statements. It has been obvious from the beginning that, in the Perlit Process, the mould temperature, the thickness, the mass and the composition are interdependent factors.

Our Company have also on many occasions been asked to come out into the open and give detailed particulars of our process, and with this object in view I have, however, been successful in obtaining an independent and unprejudiced report from Mr. A. E. McRae Smith, M.A., B.Sc., who is in the employ of Messrs. J. & E. Hall, Limited, of Dartford, which firm recently purchased a manufacturing licence from this Company. This report embodies much of the matter contained in Mr. McRae Smith's original report to the Company, which resulted in their purchasing a licence. The report also contains valuable results of investigations and tests made by him since they commenced production. The report appears elsewhere in this issue.

As some indication of the value of the Lanz Patented process I give you the names of all the present licensees of the Lanz process throughout the world. Many of these licensees bear names of world-wide repute, and most of them have research laboratories of considerable magnitude in which

List of Perlit Patents and Applications for Patents.

Country.	Original patent series 1.	Curves series 2.	Grey castings series 3.	Refined castings series 4.	Hardened castings series 4.	Dintinguishing cross-sextion series 6.
America	1502983	1544562	1574284	713604*	66461*	66462*
Argentine	—	22380	22538	22437	24619	24620
Australia	—	15937	18315	18314	25744*	25745*
Canada	—	246109	288238*	288237*	307981*	307982*
Chile	—	5433	5431	5432	applied for	applied for
China	—	1638	1697	1696	not applied for	not applied for
Belgium	289050	315085	317075	317074	328605	328606
Brazil	—	applied for	applied for	applied for	applied for	applied for
Denmark	—	1432/23*	35267	923/24*	1934/25*	1935/25*
Danzic	—	700	701	699	1000	999
England	147933	210091	225501	217885	27*	26238*
Finland	—	10841	3196*	3195*	664*	665*
Frankreich	—	576125	578120	578119	209367*	209321*
Holland	9313	25601*	26860*	26845*	31444*	31445*
Japan	—	64283	5159*	5160*	10284*	10285*
Italy	189190	217128	230420	230419	242943	242944
Jugoslavia	—	3289	3495	3494	1084*	11069*
Lettland	—	257	318	270	779*	780*
Mexico	—	23426	24166	24043	25701	25704
Norway	—	29068*	30553*	41456	33742*	33743*
Austria	80884	A250/24*	A2282/24*	A2283/24*	A5082/25*	applied for
Poland	—	P13402*	P2461*	P2460*	P2459*	P2550*
Portugal	—	13548	13718	13689	14358*	14357*
Roumania	—	8876	10363	10362	12162*	12163*
Russia	—	2765*	2766*	2767*	9446*	5822*
Spain	—	87439	89352	89211	16227*	16228*
Sweden	55774	130/24*	1328/24*	1329/24*	3093/25*	3094/25*
Switzerland ..	91927	108752	111598	111597	37020*	37021*
Czecho-Slovakia ..	11461 13684	17867	P1824/24*	P1823/24*	P4588/25*	P4519/25*
Hungary	75662 77487	L5231*	87689	87958	L5418*	15419*

Figures without stars represent patents granted. Figures marked with a star represent applications for patents.

valuable work has been done in the past and is being done at present in the interests of themselves and of every licensee of the process.

The large number of patents obtained and applied for in every industrial country of importance is, or should be, sufficient indication of the value of the invention both in regard to novelty and progress in the production of high-quality grey cast irons.

Country.	Name of Licensees.
Great Britain.	The North Eastern Marine Engineering Company, Limited, Wallsend - on - Tyne; Alfred Holt & Company, India Buildings, Water Street, Liverpool (for their foundry, Jenkins Bros.); Henry Watson & Sons, Limited, Walker Gate, Newcastle-on-Tyne; the Caledon Shipbuilding & Engineering Company, Limited, Dundee; J. & E. Hall, Limited, Dartford, and Vickers, Limited, Barrow-in-Furness.
France.	Societe Alsacienne de Mulhouse, Mulhouse.
Italy.	Ernesto Breda, Milan.
Czecho-Slovakia.	Brunn-Konigsfelder Maschinenfabrik, Brunn.
Brazil.	Hilpert & Sons, Rio de Janeiro.
Denmark.	Burmeister & Wain, Copenhagen.
Germany.	Ehrhardt & Sehmer, Saarbrucken; Linke Hoffmann-Lanchhammer, Werke - Breslau; Heintzmann & Dreier, Bochum; Ambiwerke, Berlin; Marienhutte, Kotzenau; Rheinische - Eisengieserrei, Mannheim; Bohn & Herber, Wurzburg, and Dr. Werner-Werk, Düsseldorf.

Yours, etc.,

For THE BRITISH PERLIT IRON COMPANY, LIMITED,
JOHN A. SMEETON,
Managing Director.

15, Victoria Street.

Some Notes on the Chemistry of the Cupola.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—With regard to the above Paper, published in the June 24 issue of THE FOUNDRY TRADE JOURNAL, I should be very much obliged if you would kindly draw attention to two errors which, I regret, are present:—

(1) Page 491, 9th line, under title "The Thermal Balance of the Cupola," in place of $(M-1)/y$ read $(y-1)/y$.

(2) Page 492, left column, about centre, in equation (A), in place of W. C.P. $\frac{y-0.7}{y}\ O + \lambda =$ etc., read W. C.P. $\frac{y-0.7}{y} =$ etc.

Yours, etc.,
MAURICE L. BECKER.

Metallurgy Dept., The University, Manchester.
June 27, 1926.

Patent Specifications Accepted.

The following list of patent specifications accepted have been taken from the "Illustrated Official Journal (Patents)." Printed copies of the full specification can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

3,591. FRAZIER, C. E. Annealing-furnaces. February 9, 1925. 249,636.

7,652. MCGEE, M. Electrode connections for electric furnaces. March 21, 1925. 250,002.

22,033. WESTINGHOUSE LAMP CO. High-frequency electric furnaces. January 5, 1925. 245,414.

28,758. PASTRNAK, A. Mechanical stokers for furnaces. 225,574. (November 30, 1923.) (Addition to 193,000.)

509. ROSENCRANTS, F. H. Devices for feeding pulverised fuel to furnaces. January 7, 1925. 250,312.

1,059. COGHLAN, T. G., and JOHNSEN, E. A. Method of and apparatus for removing ash or refuse from furnaces. January 13, 1925. 250,339.

"John Wilkinson" Memorial Medal Examination.

The following are the results of the above Examination which was held in May.

The winner of the "John Wilkinson" Medal was J. Yates, 14, Starling, near Bury, who is apprentice patternmaker with Messrs. Charles Walmsley & Company, Limited, Bury. The second place was gained by A. Burgess, 8, Mellor Street, Stockport, an apprentice moulder with Messrs. Henry Hollindrake & Son, Limited, Stockport; whilst the third place went to R. Yeoman, 18, Lord Street, Stockport, an apprentice moulder

MR. J. YATES
(the Winner of the John Wilkinson Memorial Medal).

with Messrs. Henry Hollindrake & Son, Limited, Stockport.

The following were highly commended:—E. Hodgetts, Messrs. R. & J. Dempster, Limited, Manchester; Harold Morris, Messrs. the National Gas Engine Company, Limited, Ashton-under-Lyne; S. B. Poole, Messrs. Whitehead & Poole, Limited, Radcliffe; F. Topham, Messrs. Hick, Hargreaves & Company, Limited, Bolton; and T. Wyatt, L.M.S. Railway Works, Horwich.

THIS YEAR the annual meeting of the Society of Chemical Industry, which begins in London on Monday, July 19, will take the extended form of a Congress of Chemists, at which not only British but international chemical interests will be strongly represented. The King has granted his patronage to the Congress, and the Duke of York and the Lord Mayor will be present at the delivery by Earl Balfour of the third Messel Memorial Lecture on the opening day at the Mansion House. The programme for the week includes, in addition to business meetings and social functions, an exhibition of British chemical plant at the Central Hall, Westminster; the annual meeting of the recently-established Institution of Chemical Engineers; a symposium on the problem of "Corrosion," to which leading chemical engineers, metallurgists and plant manufacturers will contribute; and a general discussion on the proposal to establish a national chemical headquarters in London, to be known as "Chemistry House." Mr. W. J. U. Woolcock, the retiring president, will be succeeded by Mr. F. H. Carr. What British research has already done and is still attempting to do will be explained by a group of recognised authorities, including Mr. Ulick R. Evans, who will deal with "The Fundamental Principles of Corrosion," Mr. P. Parrish, who will speak on "Corrosion and Erosion," and Dr. W. H. Hatfield and Messrs. T. G. Elliott and G. B. Willey, who will discuss "Chemically Resistant Steels."

A Note on the Properties of "Perlit" Iron (Lanz Process).

By A. E. McRae Smith, M.A., B.Sc.

"Perlit" iron is an iron of mainly pearlitic structure manufactured by a patented system of pouring iron of preferably low carbon, low silicon composition into moulds of correct temperature. One essential feature of the process is the manufacture of an iron which, if cast in a cold mould, would produce a hard, brittle, white or mottled cementitic iron, but when cast in a mould heated to a predetermined temperature, gives a tough, readily machinable, shock-resisting, high duty grey cast iron, the matrix of which is pearlitic in all sections.

In order to realise fully the unique properties of Perlit iron it is necessary to review the general physical characteristics of ordinary grey cast iron. Perlit iron has derived its name from the micro-constituent pearlite of which it is chiefly built up. In ordinary grey cast iron the percentage of pearlite present is usually low, and depends entirely on the thickness of the section of the casting for any given composition of metal. It is a well-known feature of grey cast iron that an iron which shows a close-grained fracture on a

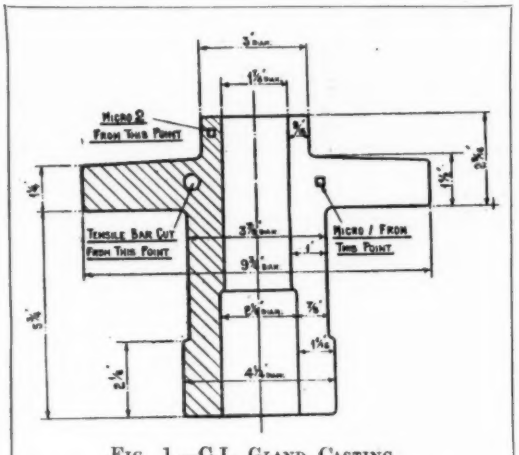


FIG. 1.—C.I. GLAND CASTING.

quarter-inch section will show a very open grain on a three-inch section in any individual casting, while an iron which is close-grained in a section of, say, three inches thickness will be white and unmachinable in a quarter-inch section of the same casting.

This is due to the fact that the percentage of carbide of iron decreases as the distance from the surface to the interior of the casting increases. The thinnest sections may consist of graphite and free white cementitic iron, while the centre of the thickest section may reach the opposite extreme of large graphite flakes surrounded by ferrite masses and almost free from carbide of iron. After primary and secondary graphite have been thrown out of solution the remainder of the carbon, which is still in chemical combination with the iron, is left in the form of pearlite consisting of alternate layers of ferrite, which is almost pure iron, and cementite which is carbide of iron, the whole containing about 0.9 per cent. carbon by weight. The white cementitic iron is extremely hard and brittle, whereas the large graphite flakes and ferritic structure of the thickest sections are soft and weak. The totally pearlitic matrix is the condition aimed at always, but not achieved in cold mould practice, when there is inequality of thickness of section in any individual casting. The common practice of using chills or denseners on thick sections in castings of unequal section in order to obtain greater equality of cooling provides a popular proof of this inherent disadvantage of ordinary grey iron.

In irons manufactured by the Lanz process the graphite flakes remain almost constant in size throughout the whole section of a thick casting, while the ground mass consists of pearlite. This can be very readily appreciated by examining polished but unetched sections taken from different points in the section of, say, a 5- or 6-in. diameter stick of Perlit iron.

This property means that the strength of Perlit iron is practically uniform from the outside to the centre of a 5- or 6-in. diameter bar. This fact will help to convince the engineer of the unique physical properties of Perlit iron. It is a well-known fact that a test bar made from ordinary grey iron 1 in. square or 1 in. diameter cast on a casting may give a test of 14 to 16 tons per sq. in. if the material is of the highest grade, but if such a test bar be cut from the centre of a 5-in. diameter section, the tensile strength would drop to 6 to 8 tons per sq. in. In the same way test bars cut from quite small and simple castings often

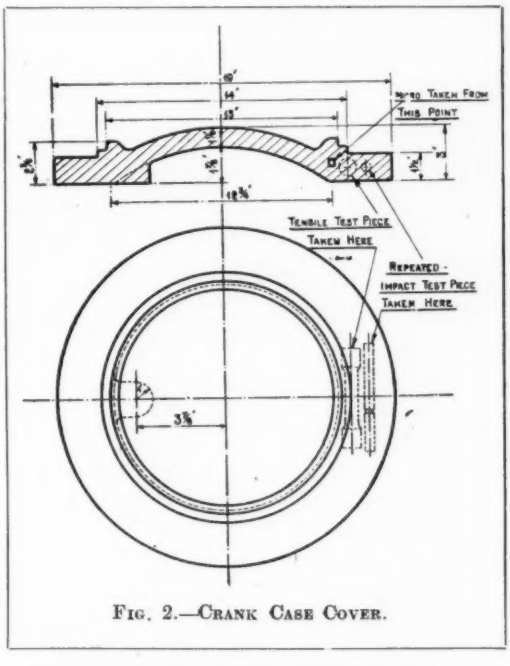


FIG. 2.—CRANK CASE COVER.

give figures infinitely less than test bars cast separately from the same metal. Reference to Table I will show this. The cover casting made in grey cast iron from cast No. LFC 528 shows quite a falling off in strength from the separately cast test bar LFC 528 to the test bar cut from the actual casting, but in the case of the same cover casting made in Perlit iron from cast No. P5 the test bar cut from the casting is equally as strong as the test bar P5C cast from the same ladle of metal. The cover casting from No. P5 consists of medium grade Perlit iron, whereas the analysis of the Cover LFC 528 is as follows:—Silicon, 1.70; sulphur, 0.10; phosphorus, 0.62; manganese, 0.58, and total carbon, 3.28 per cent., which is by no means a low-grade iron. Both castings were made from the same pattern, P5 being cast in a hot mould and LFC 528 in a dry sand mould cast at the temperature of the shop, a dry sand mould being used to equalise the conditions of the mould apart from the mould temperature. These castings are subjected to ammonia gas pressure, and unless special precautions are taken, they invariably show a porous spot near the spigot due to the inequality of section between the thick outer rim and the domed portion.

At the present time the author is collecting comparative data from Perlit and ordinary

castings over all sections up to 7½ in. dia. sticks, and it is hoped to publish the results of these tests when completed.

The uniformity in strength exhibited by Perlit castings ought to bear great weight with engineers in the design of new plant and machinery in the future.

Perhaps much more important than this is the fact that in Perlit castings the phenomenon of "drawing" caused by unequal liquid shrinkage in sections of unequal thickness is greatly minimised. In an ordinary grey iron casting on account of the great difference in the rate of cooling of a thin section adjoining a thick section the former solidifies very quickly and thus prevents the flow of metal to a thicker portion to make up for liquid shrinkage in the latter, and gives rise to the ever-prevalent and destructive "draw" or porosity patch. On the other hand, the slow rate of cooling, coupled with the "hesi-

TABLE I.—*Tests obtained with Perlit Iron.*

Casting.			Test bar.	Tensile test.			Transverse test.			Repeated impact.	Hardness.
Description and cast number.	Material.	Section.	How obtained.	Section.	Diameter.	Tensile Strength.	Size.	Centres.	Breaking load.	Deflection.	Blows of 2 lb. hammer falling 1½ in.	Brinell No.
		Ins.		Ins.	Ins.	Tons./sq. in.	Ins. Cast	Ins.	Lbs.	Ins.		
P.1.b.	Perlit	—	Test bar only	1 × 1 sq.	—	—	14 × 1 × 1	12	3,900	0.16	10,662	187
P.3.g.	,, ...	—	,,	,,	0.754	21.4	,,	,,	3,950	0.12	7,148	207
P.4.b.	,, ...	—	,,	,,	,,	18.9	,,	,,	4,100	0.15	7,156	196
P.5.c.	,, ...	—	,,	,,	,,	18.2	,,	,,	4,400	0.14	—	207
Cover casting P.5 (Fig. 2)	,, ...	1⅛	Cut from casting as per Fig. 2.	—	,,	18.4	—	—	—	—	7,448	187
Cover casting LFC. 328 (Fig. 2)	Ordy. C.I. ..	1⅛	,, ,,	—	,,	10.2	—	—	—	—	242	241
LFC. 328	,, ...	—	Test bar only	1 × 1 sq.	,,	15.6	Cast 14 × 1 × 1	12	3,200	0.07	—	241
P.4.f.	Perlit	—	,,	,,	,,	18.9	,,	,,	4,100	0.16	9,882	179
Cover casting P.4 (Fig. 3)	,, ...	—	As per Fig. 3	—	—	—	—	—	—	—	—	155 to 187
P.4.c.	,, ...	—	Test bar only	—	—	—	Cast 14 × 1 × 1	12	4,350	0.15	6,868	187
P.2. Gland casting (Fig. 1)	,, ...	2¼	Cut from casting as per Fig. 1	—	0.754	17.4	—	—	—	—	6,845	187
P.2.x. ..	Perlit mixture in cold mould	—	Test bar only	Unmachinable.			Cast 14 × 1 × 1	12	(White) 2,800 (White) 2,750	0.04	—	387
P.2.y. ..	,, ,,	—	,,	1 × 1 sq.	0.754	15.2	,,	,,	3,250	0.03	—	387
LFC. 329	Ordy. C.I. ..	—	,,	,,	,,	12.3	,,	,,	2,950	0.08	994	241
LFA. 548	,, ...	—	,,	,,	,,	11.3	,,	,,	2,800	0.09	296	207
LFA. 547	,, ...	—	,,	,,	,,	11.8	,,	,,	3,150	0.06	112	196
LFA. 550	,, ...	—	,,	,,	,,	,,	,,	,,	,,	0.08	180	207

NOTES :—1.—P.5 castings all from same ladle. P.4 castings all from same ladle, etc.
2.—Test bars marked LFA represent soft grey iron, 2 to 2.2 per cent. silicon and up to 1 per cent. phosphorus.
3.—Test bars marked LFC represent high grade grey iron 1.5 to 1.6 per cent. silicon and up to 0.6 per cent. phosphorus.
4.—The Repeated Impact Test Bars are the standard Eden Foster Bars, 0.5 in. diameter, with semi-circular groove, 0.05 in. deep.

tation" effect in the hot mould process extends the perlitisation range and so produces an all-pearlitic structure.

Perlit iron, on account of its remarkable microstructure, is also much more resistant to shock and also to growth and cracking when subjected to repeated heating. Micrographs No. 1 and No. 2 show the structure of metal taken from two points from a gland box casting as shown in Fig. 1. Both are magnified 400 diameters, and show that the lamellae of the pearlite matrix is the same whether taken from 9/16-in. section or the 1¼-in section. Micrographs No. 3, No. 4 and No. 5 show the very extreme case of sections taken from a refrigerating machine cover casting shown in Fig. 3. Here the thinnest section is ⅛ in. thick, while the thickest is 1⅞ in. thick. The remarkable uniformity of the wholly pearlitic matrix is extended even down to the ⅛-in. section. The photographs in this note represent the earliest work done in Perlit castings at the foundry in question, and more perfect specimens of Perlit with higher tensile and impact test figures may be expected as experience in control is gained.

The following summary of the physical properties of Perlit iron will be more readily appreciated when taken in conjunction with Table A.

Strength.—Tensile strength 16 to 20 tons per sq. in. Transverse tests 1 in. sq. bars tested on 12-in. centres give 3,800 to 4,400 lbs. with deflections up to 0.20 in. Similar results are also obtained from test bars cut from castings. Best cylinder irons will give 15 to 16 tons per sq. in., but only if cast not over 1-in. to 1¼-in. section. By the Perlit process any predesired tensile up to 20 tons per sq. in. can be obtained according to the type of casting required, even in large sections.

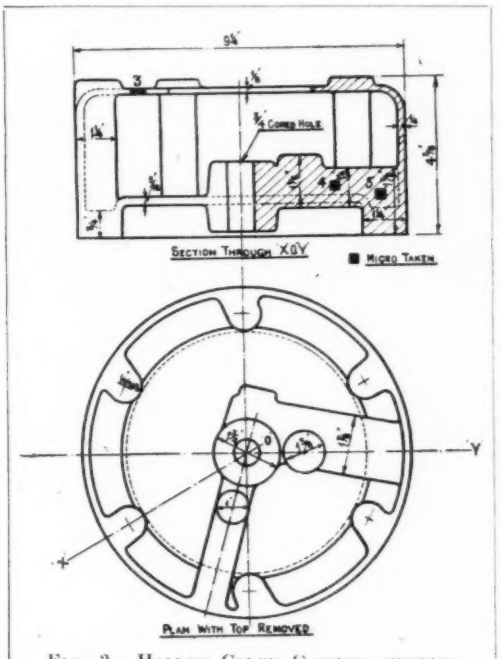


FIG. 3.—HOLLOW COVER CASTING SHOWING VARYING THICKNESSES OF SECTION.

Shock.—Repeated impact tests show Perlit castings to be remarkably resistant to shock. The figures given in Table A speak for themselves. Foundry workers are astonished at the difficulty experienced in breaking up runners and castings made in Perlit iron. One cover casting as shown in Fig. 2 defied all efforts at breaking with a 14-lb. sledge hammer.

Hardness and Machinability.—Brinell hardness varies from 170 to 207 for the very low silicon irons. With slightly higher silicon, as in casting shown at Fig. 3, the remarkably low figure of 155 has been obtained with this high duty cast iron. High tensile cylinder irons usually give Brinell hardness figures of 240 to 270 when cast in 1-in. section test bars. Thus high tensile Perlit is as easily machined as soft grey irons.

Uniformity of Structure.—Castings of widely unequal section will show the same pearlitic structure at all thicknesses.

Growth.—Perlit iron shows practically no growth at all under severe conditions of repeated heatings.

Resistance to Abrasion.—The uniformity of the pearlitic matrix seems to bring with it greatly increased resistance to abrasion. This fact has at present only been fully demonstrated on German samples made by Lanz. Further research is necessary to determine the exact extent of this property.

Details of the Process.

Castings in Perlit iron can be produced either by (1) varying the mould temperature and keeping the composition of the metal constant, *i.e.*, low carbon, low silicon metal. The smaller the mass or section of the casting, the higher the temperature of the mould, up to a maximum of, say, 500 deg. C. for quite thin sections. Three hundred to 450 deg. C. is the range for most castings; (2) employing a constant mould temperature and varying the silicon content of the metal to suit the mass of the casting; and (3) varying both factors.

The control of the metal composition is a simple matter for any modern foundry, but a small chemical laboratory is essential. Control of the metal temperature is also extremely important, but granted it is in excess of a predetermined minimum no difficulties are experienced, provided the composition and mould temperature are also correct. Pig-irons of suitable composition may be bought in, but probably the simplest, and certainly the most economical, way is to make one's own mixtures by refining or diluting ordinary grades of pig-iron and scrap with steel additions. Manganese additions are made in the usual way. Where freedom from growth is the main objective, phosphorus should be as low as possible, say not exceeding 0.15 per cent., but for high duty only phosphorus up to 0.4 per cent. does not adversely affect the pearlitic structure. Carbon in the neighbourhood of 3.0 per cent. is aimed at.

MICRO. NO. 1.—"PERLIT" GLAND CASTING (FIG. 1). PEARLITE FROM POINT (1) OF CASTING. SECTION 1½ IN. MAGNIFICATION × 400 DIAS.

Such diluted pig-iron or such mixtures can be obtained within close limits day after day without any trouble, and can be manufactured for a figure well within the range of many branded cylinder pig-irons. Thus the metal cost for Perlit is very little, if any, above that of good class ordinary grey cast iron.

The drying of the moulds and cores takes place in the usual way. When thoroughly dry the moulds are assembled, closed and re-heated as a separate operation. This re-heating of the assembled mould is the only real extra cost which is involved in the process, where dry sand moulds were originally employed for the castings. In cases where Perlit iron has replaced green sand castings the difference in cost betwen dry sand and green sand moulding has to be added to this figure. Against this, cases have arisen and will arise where Perlit castings replace certain special cast irons, malleable iron and steel castings, in

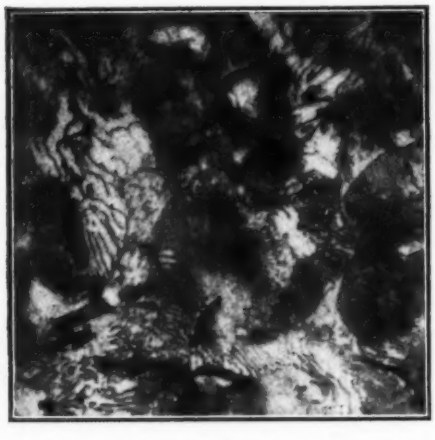
which cases the new castings will be cheaper than those which they replace. If engineers can obtain a thoroughly reliable iron casting possessing uniformity of strength, with consequent reduction in weight and greater durability, the additional cost per cwt. will be readily offset.

The preheating of the moulds is easily carried out, and no difficulty is experienced in handling and casting the hot moulds. Sand mixtures as used in dry sand moulding may be adapted for Perlit castings with but little alteration, and oil and starch sand cores may be used where suitable.

Much criticism of the Perlit process and Perlit

MICRO No. 2.—"PERLIT" GLAND CASTING (FIG. 1). PEARLITE FROM POINT (2) OF CASTING. SECTION 9/16 IN. MAGNIFICATION × 400 DIAS.

castings has appeared in the British foundry and other technical Press during the last six months. This is only to be expected where a new process has been introduced, and one is reminded of the story of "Milestones"—wooden ships—iron ships—steel ships. However, the author, who was very sceptical about this process when scanty details first appeared in the Press, would urge metal-



MICRO. No. 3.—"PERLIT" COVER CASTING (FIG. 3). PEARLITE FROM POINT (3) OF CASTING. SECTION $\frac{1}{8}$ IN. MAGNIFICATION × 400 DIAS.

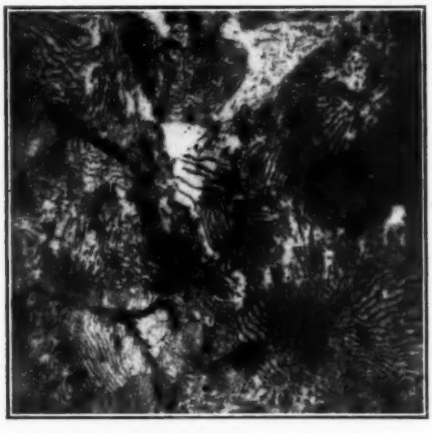
lurgists and foundrymen not to criticise or condemn Perlit iron without first testing out or having tested out for them properly manufactured samples. In a recent article the contributor was bold enough to assume that it was unlikely that an iron cast in a hot mould would be superior in quality to the same iron cast in a cold mould. Obviously the writer in question had not seen authentic specimens of a Perlit iron mixture cast from the same ladle into hot and cold moulds to produce castings of the same thickness and mass. One fact which appears to be lost sight of is that sand at a temperature of 400 deg. C. is an extremely bad conductor of heat, and the actual rate of cooling is extremely slow. Small castings weighing less than 2 lbs. each produced in 14 × 10-in. boxes and 4½ in. deep, two parts per box, have been much too hot to handle comfortably when left in the sand from 3.30 p.m. to 9.30 a.m. next day. When the final cooling is so slow undoubtedly the initial cooling through the critical range will also be slow.

Also even if one might expect to get increased grain size with slow cooling, this grain size has little or no relation to the size of the pearlite lamellae, and instead of slow cooling having the effect of reducing the impact value, reference to

MICRO. No. 4.—"PERLIT" COVER CASTING (FIG. 3). PEARLITE FROM POINT (4) OF CASTING. SECTION 1⅛ IN. MAGNIFICATION × 400 DIAS.

Table I will show that *the impact value is actually increased enormously.*

Much research is undoubtedly necessary to explain the exact mechanism of the Perlit process as at present there is little data to work on, but as far as the actual product is concerned castings can be produced and reproduced day after day giving very uniform results and having entirely



MICRO. No. 5.—"PERLIT" COVER CASTING (FIG. 3). PEARLITE FROM POINT (5) OF CASTING. MAGNIFICATION × 400 DIAS.

pearlitic structures. At present the foundry with which the writer is associated uses three grades of Perlit iron varying in silicon content from 0.5 to 1.3 per cent., the latter being used only for castings having sections down to ⅛ in. For castings from ¾-in. up to 2-in. section 0.7 to 0.85 per cent. silicon is used, the mould temperature being adjusted to suit the mass of the particular castings being manufactured.

In conclusion, the author wishes to express his sincere thanks to the directors of Messrs. J. & E. Hall, Limited, for allowing him to publish this note describing early results obtained in initiating the Perlit process in their foundries and laboratory.

International Foundry Trades' Exhibition.

BANQUET TO OVERSEAS VISITORS.

On Thursday, June 17, a banquet was offered by Messrs. F. W. Bridges & Sons, Limited, at the Royal Agricultural Hall, Islington, in honour of overseas delegates and visitors; officials of the Institute of British Foundrymen also being present.

This successful function was presided over by Mr. V. C. Faulkner, Chairman of the Foundry Trades Equipment and Supplies Association and President of the Institute of British Foundrymen.

The principal guests of the evening were as follows:—Dr. J. G. Edholm, Senor J. M. Espana (President of the Spanish Foundrymen's Association), Dr. Geilenkirchen (Secretary of the German Ironfounders' Employers' Federation), Mr. P. L. Gould, Dr. Lohse, Mons. Gustave Masson (President of the Belgian Foundrymen's Association), Mons. E. Ronceray (Vice-President of the French Foundrymen's Association), Mr. Oliver Stubbs President of the Ironfounders' Employers' Federations), and Mr. F. J. Taylor.

The toast of "The King," proposed by the CHAIRMAN, was loyally responded to.

Decline in Iron and Steel Production

"Our Guests from Overseas" was proposed by MR. OLIVER STUBBS, M.I.Mech.E., who said he claimed to have a particular interest in the gathering that night, as it had been his privilege, in 1922, to go to the United States, in the company of the late Mr. Firth, of Sheffield, and Mr. F. J. Slater, with the object of initiating an International Foundrymen's Convention.

It gave him great delight to be associated with this toast, as he always held the opinion that if they could bring about these conventions far better relationship between nations would exist, both on the commercial side and on the industrial side, and it would lead on to clearing away many of the difficulties which existed at the moment.

"You have come to this country when we are passing through a very serious time, and I do not think you can accuse us of keeping our hearts on our sleeves, because we do try to be merry and bright through it all," continued Mr. Stubbs. "We feel that we are all the better for having mixed together."

He had some figures before him which he thought were rather alarming as regards the huge steel losses in this country due to the coal crisis.

The total output of pig-iron in Great Britain in May was only 88,800 tons, compared with 539,100 tons in the previous month and 574,700 tons in May, 1925. The production of steel castings was 45,700 tons, compared with 661,000 tons in April, and 651,600 tons in May, 1925. There were 23 furnaces in blast at the end of May, compared with 147 at the end of April.

He thought they would agree with him, in face of these figures, that it was impossible to put up a very good show; but for the general strike we should have had a very much bigger exhibition and larger attendance.

At this Exhibition they could not help but admire the products of other countries, and particularly, perhaps, those of America. The American labour-saving devices certainly were excellent, but there was one point which had to be taken into consideration, namely, they were eliminating the skilled moulder from the trade, and what was going to happen to him? It is a question which is bound to be faced.

In research work, continued Mr. Stubbs, some nationalities had gone into many questions very much more deeply than the British, but it was obvious from this Exhibition that much advance is being made in this direction.

He hoped that all present would foster the idea of international relationship. What is required in this world is industrial peace and a proper understanding between all nations. He was of the opinion that it was a shame that a small number of men should very largely be responsible for the industries of this country "drying up," so to speak, because there was no doubt but that vast numbers of men were willing to work if left alone.

The troubles now being experienced here are sure to recur in other countries sooner or later, because of the lack of that human touch between employer and employee which still needs eradicating. He hoped his listeners would excuse his talking about these things, but he thought they would agree with him that there were occasions when these expressions of opinion were justified.

With the toast was coupled the names of Dr. Geilenkirchen, Dr. F. G. Edholm and Mr. V. Delport.

DR. GEILENKIRCHEN, Secretary of the German Ironfounders' Employers' Federation, and Editor of "Die Giesserei," replied to the toast in German, expressing on behalf of his co-nationals their deep appreciation of their reception.

DR. F. G. EDHOLM was deputised by his brother, who expressed thanks on behalf of the Swedish delegates for the toast and for all the hospitality and facilities they had been given during their visit.

He was sure they had all enjoyed everything thoroughly and were heartily thankful, and they also hoped that they would have the pleasure of one day entertaining their British friends in Sweden. In conclusion, they wished the Institute of British Foundrymen continued prosperity.

MR. DELPORT (European representative for the American Foundrymen's Association) said he was very glad so many nations were represented in the present gathering. These people were now in a position to understand things from the point of view of their British friends. It happened that he was at present engaged in organising a party to go to America for the second foundry congress, and he thought this was a splendid opportunity of seeing the modes of living and circumstances in America which those who had never been there could hardly imagine. He thought that such international conventions could help a great deal in furthering good feeling and better understanding between nations.

A Basic Industry.

MONS. E. RONCERAY, proposing the toast of "The Foundry Industry," expressed the opinion that the foundry industry was a most important one, because it supplied the goods for providing us with the requirements of life, namely, food, water, gas, heating, clothing, and so on. No machines, no implements can be made without the help of the foundry industry, and, as Mr. Stubbs said, it has not been sufficiently recognised in the past, but it has now been raised as the result of gatherings such as the present one. It is one of the most important industries of the world, and as such it deserves and merits a special toast. He always felt proud of his association with the foundry industry.

MR. F. J. TAYLOR, responding to the toast, pointed out that the Exhibition was being held at a most unfortunate time and that present circumstances had in no small way gone against it.

The foundry trade has been in the past the cinderella of the engineering industry, but, as a result of the excellent work which is being done, it is now progressing.

Going back to the Bible, one finds that there is some mention of the casting of those wonderful pillars in King Solomon's temple, but it is noticeable that no mention is made of the weight of these castings, which he thought was typical of the brassfoundry trade. (Laughter.)

He had been particularly interested in one exhibit, and that was the layout of a foundry, with every facility of economy in all directions.

MR. WESLEY LAMBERT, proposing the toast of "The Chairman," said he was delighted to have the opportunity of being able to express his appreciation of everything that had been done during the Exhibition and Convention. They all recognised the value of Mr. Faulkner's work in connection with the foundry industry of this country, not only as Editor of THE FOUNDRY TRADE JOURNAL, but also for the Institute of British Foundrymen he has done invaluable work. He

could assure their overseas visitors that Mr. Faulkner had done some excellent work in this country, and seemed to be able to cope with everything he came up against.

He thought they would agree with him that the London Convention of the Institute of British Foundrymen, with Mr. Faulkner as President, was a very successful one.

MR. FAULKNER, responding, thanked Mr. Lambert for the way in which he had proposed the toast and all present for the kindly way in which they had received it.

International Relationship.

He would like to take this opportunity of expressing a few views on international relationship, and would preface his remarks by the time-worn adage of "Science knows no boundaries."

He had been fortunate that morning in meeting Dr. Geilenkirchen, and, as a result of that meeting, next year in Sheffield the Institute was to have an exchange Paper from the German Association by Professor Piwowarsky.

Although the system of exchange Papers originated only about five years ago, at least sixty Papers had been exchanged between different countries, and, although Papers may be exchanged between, say, Belgium and France, they are also available for the British and foreign Press. There was a large number of foundry journals throughout the world which constitute real channels through which foundry progress and ideals are constantly flowing. The Press certainly does make a very real contribution to the international aspect of the foundry industry.

Another point he wished to bring up was that of statistics. He thought it was to be admitted that other countries were in a better position than England for ascertaining whether they were gaining or losing ground.

At the Institute's banquet he had the pleasure of sitting between Sir Alfred Mond and Sir Wm. Larke, and he took the opportunity of that occasion of pressing the point that the Board of Trade must provide the foundry industry of Great Britain with suitable statistics. At the present time they are very much involved, and if one wants to know how many cast-iron pipes have been produced it is impossible to tell, because tubes were included with them. He was sure the former ought to be sufficiently important to warrant a separate classification.

There were some curious conditions in the foundry trade, and he thought that reorientation could only be brought about by friendship between countries. If we examine the statistics of countries such as Argentine, Peru and Brazil, we find that their cast-iron pipes come purely from Great Britain in the one case, in a second case from Germany, and in a third from France, Germany and England. Why should one country take simply German products and other British? The only answer he could give was that there must be friendly relationship between these countries. If we were only taught to think internationally we would all be getting better results.

In Britain high rates had to be paid for labour and taxation, and he hoped other countries which had depreciated currency would not take advantage of this. It was very bad international business for one country to take advantage of its depreciated currency, and it ought to first consider whether it will be able to replace existing stocks at a price upon which it was quoting. If they did not take cognisance of this factor they were exporting currency and heading for national bankruptcy.

In conclusion, the Chairman proposed a toast to Messrs. Bridges & Sons for their kind hospitality. He thought that, of all the people in Great Britain who organised exhibitions, none could equal Messrs. Bridges. He believed that this was the second coal strike they had had to work against, but they always managed to pull through with credit to themselves.

MR. BRIDGES, SENR., replying, said that they were honoured at being able to entertain visitors to the Convention and Exhibition, and it gave them great pleasure to meet so many gentlemen from other countries of the world. He had had the privilege of visiting many different countries, and had always received great hospitality. Last year he had the pleasure of attending the American Foundrymen's Convention, and could assure all who were going this year that they may depend upon having a thoroughly good time.

He must give America the credit of being able to do things of that nature better than they could, but he thought they would agree that this Exhibition, considering everything which had been against it, was a very good second to America. If the gentlemen from other countries would only honour our country next time he arranged an exhibition they would be given something much better. When all our industrial disputes were settled he was going to have the exhibition hoped for this year. It was the first time he had had the honour of co-operation with the Foundry Trades' Equipment Association, and he could assure them it is a very live body, although it has only been in existence for 18 months.

In conclusion, he thanked them for accepting the invitation, and hoped they had enjoyed their visit and that they would come to England again.

MR. BRIDGES, JUNR., said that, as this was the last official function connected with the Exhibition which he would attend, he felt that there were one or two things he would like to say, although perhaps they had not very direct bearing upon the particular function, but rather had reference to the Exhibition in general.

He had been very impressed by the importance of the foundry trade to the whole industry of the country. At the Institute's banquet they had heard Sir Alfred Mond speaking about the foundry industry, and he, personally, had been very impressed by its importance. If this Exhibition had done anything to further that trade he felt that they had taken part, not only in a commercial enterprise, but in something which would assist the industry of this country generally.

He was entirely a layman, and had been thoroughly dependent upon his friends in the Foundry Trades' Equipment Association, not forgetting the help of the Technical Advisory Committee for every single thing he had been able to do.

In the course of his experience it had been his fortune to be associated with a good many exhibitions of various kinds, in this country and elsewhere, but he could say, without the slightest hesitation, that none had given him so much pleasure to organise as the present one.

He was extremely grateful to the members of the Council of the Equipment Association, and also to the gentlemen who had assisted by showing technical exhibits. He wished to express thanks for the assistance they had given, and he felt that the success of the Exhibition was entirely due to their efforts.

HOLDERS OF THE 5 per cent. (tax free) first debenture stock of the Barrow Hematite Steel Company, Limited, are asked to consider proposals (1) to issue further debentures for an amount not exceeding £219,607, ranking *pari passu* with the existing stock, (2) to suspend the sinking fund operation for the redemption of the first debentures until June 30, 1931; and (3) to extend the period for the redemption of the said debentures from July 1, 1940, to July 1, 1950. In submitting these proposals the directors state that the unprecedented and prolonged depression in the industry has rendered it impossible for the company to obtain satisfactory results from the extensions and improvements outlined when the present issue was made in 1919. Under the depressing trade conditions the provision of the sinking fund instalment has proved a severe drain on the company's financial resources. Stock to the amount of £219,607 has been redeemed, and this has resulted in an overdraft with the bankers. It is the debentures that have already been redeemed it is proposed to re-issue, the object being to secure the additional accommodation to enable the undertaking to carry on its business. The proposals have been submitted to an informal committee of debenture holders. This committee has approved of the proposals on the following conditions—(1) That the bankers shall be satisfied with their existing securities for advances to the company up to £100,000; (2) that the £219,607 debentures shall only be reissued on conditions to be approved by an independent director to be elected to represent the debenture holders; and (3) that the debenture holders shall be entitled to be represented on the board, the first such director to be Mr. J. Douglas Broad. These conditions have been accepted by the board.

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Trade Talk.

THE STATEMENT that the steelworks at Panteg, Mon., of Baldwins, Limited, have closed indefinitely owing to lack of coal, is incorrect.

LOUDON BROTHERS, LIMITED, of Johnstone, Glasgow, and London, have secured a contract for plant for the New Zealand Government Railway Workshops.

ERNEST FARRELL, John Miller & Company, Whitehouse Bros., Limited, the Atlantic Engine Company (1920), Limited, and the Morton Machine Company have been elected members of the Federation of British Industries.

J. I. THORNYCROFT & COMPANY, LIMITED, have secured a contract to build four refrigerated steel lighters for the Union of South Africa. These craft are to be 85 ft. overall, 20 ft. 6 in. in beam, and 8 ft. 6 in. in depth.

JOHN REDHEAD & SONS, LIMITED, of South Shields, have secured two orders for their shipyard. One is for a cargo boat for J. T. Readhead & Company, Newcastle-on-Tyne, and the other for a collier for Stephenson, Clark & Company, London.

AT THE RECENT conferences between the Austrian and Czecho-Slovak iron and steel combines the Hungarian works were also represented. The main subject discussed on these occasions was the attitude to be assumed by the Mid-European combine in the matter of price-fixing by the proposed international combine.

THE NATURAL RESOURCES INTELLIGENCE SERVICE at Ottawa reports that with 2,300 men actively employed at the Algoma Steel Corporation plant the steel-making outfit of the concern is now at capacity. In addition to the rail orders now being turned out, there is an increase in the demand for automobile steel, more than the usual amount of this tonnage being manufactured just now.

HARVEY-SIEMENS FURNACES (GIBBONS BROS., LIMITED, of 26, Victoria Street, Westminster, S.W., have received an order from Guest, Keen & Nettlefolds, Limited, for two of their special furnaces for heating 2,300 tons of steel slabs per week. These furnaces are complete with gas producers having mechanical coal-feeders, and are to be built at the East Moors Works, Cardiff.

THE CONTRACTS of the Canadian Pacific Railway Company for two "M" class vessels for the North Atlantic trade, have been awarded to John Brown & Company, Limited, and William Beardmore & Company, Limited. The principal dimensions are: Length between perpendiculars, 585 ft.; beam, 75 ft.; draft, 27 ft. Each vessel will have a grose tonnage of 18,000, and a carrying capacity of 4,000 tons, together with a passenger carrying capacity of approximately 1,600.

THE GRINDING AND PULVERISING DEPARTMENT of International Combustion, Limited, 11, Southampton Row, announce a repeat order for the latest type 8 ft. dia. x 36 in. Hardinge conical ball mill, complete with chrome lining, balls, motor and classifier for the wet grinding of lead zinc ore from 1½ in. to 48 mesh; 4½ ft. dia. Hardinge conical ball mill, for the dry grinding of sillimanite; Raymond pulveriser, complete with air separator for grinding barium peroxide; separating plant for separating Fullers earth, and one 4 ft. and one 8 ft. heavy type 39 Hum-mer electric screens, for screening abrasive pyrite, producing 1½ in. and ½ in. products.

TWO VESSELS were launched on Wearside on June 10. One of the vessels was the first of the six motorships ordered by the Silver Line, Limited. The vessel is 442 ft. in length, is intended for special trade between the United States and the Far East, and will be fitted with Doxford engines. The second vessel was the Anglo-Peruvian, building by Short Bros. to the order of Lawther, Latta & Company, Limited, for the Nitrate Producers' Steamship Company, Limited, of London. She is designed to carry 10,000 tons deadweight, and will be fitted with quadruple expansion engines constructed by the North-Eastern Marine Engineering Company, Limited, Wallsend.

THE DELAYS in the delivery of iron and steel products ordered from British firms before and during the coal strike have presented an exceptional opportunity to Continental manufacturers to improve their position in the Colonial markets. The Association of British Manufacturers of Wire and Wire Netting have sent a memorial to Mr. Bruce, the Australian Premier, calling his attention to the German competition, and asking for the imposition of an adequate duty on the products of countries where, as a result of recent currency depreciation, prices are greatly below those ruling in Britain and Australia. The memorial also points out that prices charged by German manufacturers for the home trade are considerably below the export charges, and also that the German steel trade has reintroduced the export bounty system. The memorial asks for a dumping duty to be imposed, and also for a preferential duty reflecting the difference in wages and labour conditions on the Continent and Britain approximating 50 per cent.

Obituary.

MR. E. JELLYMAN, of Cannock, who for many years had carried on the business of an iron founder and engineer, died recently. The deceased gentleman was 61 years of age.

MR. W. J. GORDON, who has died suddenly at Barrow, was employed by Vickers, Limited, for nearly fifty years, rising from an apprentice to the position of chief of the designing and drawing office of the marine engineering department.

M. CAMILLE CAVALLIER, chairman of the board of the Pont-a-Mousson Cast Iron Pipe Foundries, died suddenly in Nancy on June 10. The deceased gentleman has been for more than 40 years at the head of the company, and was also a director of many other concerns in France, where he was one of the leading figures in the mining and industrial world.

Contracts Open.

Braamfontein, S.A., July 22.—Structural steel and woodwork, for the South African Railways and Harbours. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3257.)

Johannesburg, July 15.—3,030 water meters (Contract No. 643), for the Municipal Council of Johannesburg. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3254.)

Johannesburg, July 15.—150 2½-in. hydrants, with cast-iron bodies, etc. (Contract No. 648), for the Municipal Council of Johannesburg. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3255.)

Johannesburg, July 15.—100 malleable cast-iron special meter boxes (Contract No. 644), for the Municipal Council of Johannesburg. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3258.)

Johannesburg, July 15.—Pump trolleys, wheels, axles, bearings and housing for bearings for gangers' and platelayers' trolleys, for the South African Railways and Harbours. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Ref. A.X. 3,263.)

Johannesburg, July 29.—Ten miles of copper trolley wire and 50 miles of underwriters' wire (Contract No. 646), for the Municipal Council of Johannesburg. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3249.)

Johannesburg, July 29.—Locomotive carriage and wagon axles, for the South African Railways and Harbours. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference A.X. 3265.)

London, S.E.1, July 6.—Grain-handling plant, for the Director-General, India Store Department, Pranch No. 14, Belvedere Road, Lambeth, S.E.1.

Pretoria, S.A., July 8.—Metal lockers, for the Department of Posts and Telegraphs. The Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference B.X. 2631.)

Personal.

SIR A. KAYE BUTTERWORTH, who has been elected a director of Sir W. G. Armstrong, Whitworth & Company, Limited, was the former chief of the North-Eastern Railway Company. He was formerly on the legal staff of the Great Western Railway, and later accepted the position of Clerk to the Bedfordshire County Council. After two years he was appointed solicitor to the North Eastern Railway Company, and in 1906 succeeded Sir George Gibb as general manager. He was knighted in 1914.

Wills.

ALEXANDER, W., of Kelvinhaugh Road, Glasgow, and of Randolph Gardens, Broomhill, machinery merchant £6,050

PURVIS, T., formerly chief accountant of the Elswick Steel Works of Sir W. G. Armstrong, Whitworth & Company, Limited £5,148

JOWETT, T., of Willford & Company, Limited, spring manufacturers, Sheffield and Glasgow, chairman of the British Industrial Corporation, Limited, and of Ferodo, Limited, lately a director of the Bengal Iron Company, Limited, and the United Steel Companies, Limited £721,370

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IRON AND STEEL MARKETS.

Pig-Iron.

MIDDLESBROUGH.—The almost complete suspension of pig-iron outputs in the Cleveland area has resulted in what must soon become a serious embarrassment to consumers, stocks in makers' yards having been practically depleted by deliveries on contract account, with but faint prospects of an early renewal of furnace production only possible when fuel supplies are once more available. In the conditions thus briefly outlined business in Tees-side markets can only be termed nominal, while, as regards the export trade in Cleveland pig, it is non-existent; there is none to spare, and if there were the price would make it absolutely prohibitive. At this week's market sellers were asking 84s. per ton for any little parcels of No. 3 G.M.B. still to be picked up. This represented an advance of 4s. per ton over the price the previous week, and of 14s. per ton since the strike began. Other qualities were just as scarce, No. 1 being quoted at 86s. 6d., No. 4 foundry 83s., and No. 4 forge 82s. 6d. per ton.

A similar position is disclosed in East Coast hematite, the available stocks having been largely reduced of late, and an advance in prices being regarded as probable in the near future. The idleness at the steelworks has reduced the home demand for hematite to zero, but there are still small parcels going abroad, notwithstanding the price. Mixed numbers still stand at about 78s. 6d. per ton, although in some instances sellers are demanding 79s. On the North-West Coast prices are still maintained at their old level, Bessemer mixed numbers being quoted at £4 2s. 6d. c.i.f. Welsh ports, £4 5s. 6d. to £4 7s. 6d. per ton delivered at Glasgow, £4 8s. to £4 10s. per ton delivered at Sheffield, £4 15s. to £4 16s. 6d. per ton delivered at Birmingham.

LANCASHIRE.—In this area, with most of the foundries stopped for want of coke, the demand for pig-iron is, of course, less pressing than it was, but the fact that offers are being taken up readily enough may be inferred from the steadily increasing quotations. For Derbyshire No. 3, supplies of which continue to be offered, from 92s. 6d. to 93s. per ton, delivered Manchester or equal distance, has been the basis of recent quotations. Scottish No. 3 is firm at 97s. 6d. per ton, with Middlesbrough No. 4 ranging round 93s., and small parcels of high-silicon iron at up to 90s. per ton.

THE MIDLANDS.—At the Birmingham markets of late the limited supplies of foundry pig available for disposal at the Northants, Derbyshire and North Staffordshire furnaces are fetching very fancy prices, but there is no difficulty in getting rid of the sparse tonnage remaining, the majority of the makers being cleared out entirely, and having nothing at all to offer. Derbyshire off-grades have been sold at 90s. per ton f.o.t., and Northants silky has been quoted at 82s. 6d. per ton f.o.t.

SCOTLAND.—The two furnaces in blast in the Clyde-side district having been closed down, there is now no pig-iron being made in Scotland. Stocks are going steadily down, as founders are, to a large extent, still carrying on, and are inclined to take more interest in pig-iron. Makers, however, are reluctant to sell, except to a limited extent, and are very stiff in their ideas of values, although, unlike the Cleveland makers, they are not rushing up prices unduly. The general quotation for No. 3 Scotch foundry is unchanged at 80s. at the furnaces.

Finished Iron.

The position in regard to bar iron is unchanged; practically the whole of the works' stock has been taken, and what little is left is being disposed of at £11 10s. for crown quality. There has been practically no business for forward delivery, and the pre-strike figures have not, so far, been changed officially, although it is doubtful whether the ironworks will quote the prices then obtaining for delivery after resumption. They were £11 5s. for crown, £9 15s. to £10 for nut and bolt, and £14 at makers' works for marked bars. There has been quite a number of transactions within the last week for Continental iron for July/August delivery at prices varying from £5 17s. 6d. to £6 2s. 6d. per ton, delivered works in this area. Deliveries from the Continent against old contracts are still very much belated.

Steel.

At Sheffield, steel melting operations are practically at a standstill, and most of the mills and forges have ceased. The engineering and light foundries are working well in the circumstances, fairly good supplies of coke being available. There is little difficulty about electricity and gas for power, and the lighter sections of industry which rely on these are able to maintain something approaching normal conditions. It is stated that there are many good orders in the light and heavy branches about, but how long customers will wait before cancellation is causing anxiety. In the tinplate market, inquiries are coming along for delivery when works restart, and a small amount of business is reported on a basis of round 20s., f.o.b. Wales. Few makers care to commit themselves, however, and the orders are being booked mainly by merchant sellers. Stock plates are rapidly being cleared out, and it is reported that upwards of 23s. has been paid by consumers for prime plates and 22s. for wasters.

Scrap.

Owing to the prevailing scarcity of pig-iron at the moment, there has been a slightly increased demand for scrap of suitable quality for foundry purposes. In Scotland, for example, some business has been done in cast-iron machinery scrap and heavy ordinary material, the first-named at 75s. to 76s. 3d. per ton and the latter at 70s. to 71s. per ton, an advance of about 4s. per ton on the price recently ruling. Quotations for other descriptions of scrap metals are only nominal.

Metals.

Copper.—Following the slight improvement reported in conditions the previous week, the market for standard copper has again relapsed into its former state of inactivity, with a tendency to easier values. The American market, incidentally, continues to show firmness, although transactions seem at times to have languished, but, as American consumers are reported to be holding but small stocks, this may possibly account for the steadiness of prices in that country, which naturally has considerable effect on the London market.

Official closing prices of standard copper have been as under :—

Cash : Thursday, £56 15s.; Friday, £56 15s.; Monday, £56 12s. 6d.; Tuesday, £57; Wednesday, £56 17s. 6d.

Three Months : Thursday, £57 12s. 6d.; Friday, £57 12s. 6d.; Monday, £57 10s.; Tuesday, £57 15s.; Wednesday, £57 15s.

Tin.—A somewhat firmer tone may be noted in tin values, prices at the week-end close having improved to the extent of about 20s., with a fairly substantial volume of business transacted. The situation here seems to be met with confidence, and an increase in the premium of Straits over standard cash, coupled with the favourable amount of business that is still being done with New York, seem to show that the recent low levels touched by this commodity have been surmounted.

Official closing prices of standard tin have been as follow :—

Cash : Thursday, £272 15s.; Friday, £273 12s. 6d.; Monday, £272; Tuesday, £272 5s.; Wednesday, £272.

Three Months : Thursday, £272 2s. 6d.; Friday, £273; Monday, £271; Tuesday, £271 12s. 6d.; Wednesday, £271 10s.

Spelter.—After a slight moderation in price about the middle of last week, a rally was experienced, and quotations attained about the same levels as were reached at the commencement. This action seems to be merely a lull before a further advance, as there is no accumulation of stocks which would tend to give an adverse tendency. The American market, however, has evidenced no marked change, and remains firm.

The following are the week's prices :—

Ordinary : Thursday, £33 13s. 9d.; Friday, £33 8s. 9d.; Monday, £33 3s. 9d.; Tuesday, £33 12s. 6d.; Wednesday, £33 13s. 9d.

Lead.—The market for soft foreign pig continues firm, although there is no reason to expect a marked increase in values under present conditions. The relaxation of prices may, to a certain extent, be credited to the covering of shorts, which was a feature of the market recently, and no doubt had a considerable influence on the present position.

The week's prices are appended :—

Soft foreign (prompt) : Thursday, £30 2s. 6d.; Friday, £29 17s. 6d.; Monday, £29 17s. 6d.; Tuesday, £30 3s. 9d.; Wednesday, £30 8s. 9d.

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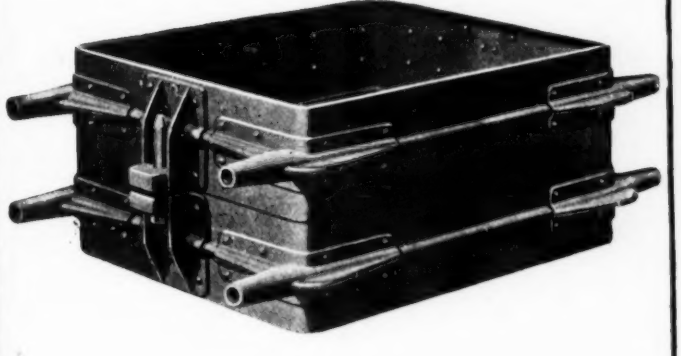

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Sheets	90	0	0
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Wire bars	65	0	0
Do. June–July ..	64	12	6
Do. July–August	64	15	0
Ingot bars	64	12	6
H.C. wire rods ..	69	5	0
Off. av. cash, May	56	11	1½
Do., 3 mths. May	57	8	10½
Do., Sttlmnt, May	56	10	4½
Do., Electro, May	64	10	10½
Do., B.S., May ..	60	14	4½
Aver. spot price copper, May ..	56	10	4½
Do., wire bars, May	64	15	6
Solid drawn tubes			12½d.
Brazed tubes ..			12½d.
Wire			9½d.

BRASS.

Solid drawn tubes ..	11½d.
Brazed tubes	13½d.
Rods, drawn	10½d.
Rods, extd. or rlld. ..	7½d.
Sheets to 10 w.g ..	10½d.
Wire	9½d.
Rolled metal	9½d.
Yellow metal rods ..	7½d.
Do. 4 × 4 Squares	8d.
Do. 4 × 3 Sheets ..	8½d.

TIN.

	£	s.	d.
Standard cash ..	272	0	0
Three months ..	271	10	0
English	270	0	0
Bars	274	0	0
Straits	281	15	0
Australian	274	5	0
Eastern	277	10	0
Banca	276	0	0
Off.aver. cash, May	270	5	0¾
Do., 3 mths., May	266	14	5¼
Do., Sttlmt. May	270	4	9
Aver. spot., May	270	4	9

SPELTER.

Ordinary	33	13	9
Remelted	33	0	0
Hard	28	0	0
Electro 99.9 ..	36	0	0
English	34	5	0
India	31	0	0
Zinc dust	42	0	0
Zinc ashes	14	10	0
Off. aver., May ..	32	4	6
Aver., spot, May	32	0	9

LEAD.

Soft foreign ppt.	30	8	9
English	31	15	0
Off. average, May	28	9	8½
Average spot, May	28	5	0

ZINC SHEETS, &c.

Zinc sheets, English	42	0	0
Do. V.M. ex whf.	38	10	0
Rods	44	0	0
Boiler plates ..	38	10	0
Battery plates ..	38	0	0

ANTIMONY.

Special brands, Eng.	79	10	0
Chinese	60	0	0
Crude	30	0	0

QUICKSILVER.

Quicksilver ..	15	5	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon 25%	9	0	0
45/50%	11	7	6
75%	19	15	0

Ferro-vanadium—
35/40% 14/9 to 15/3 lb. va.
Ferro-molybdenum—
70/75% c. free 5/11 to 6/– lb.
Ferro-titanium—
23/25% carbonless 11½d. lb.

Ferro-phosphorus, 20/25%,	£17	0	0
Ferro-tungsten— 80/85%,c.fr. ..	1/5½ lb.		
Tungsten metal powder— 98/99%	1/10½ to 1/11 lb.		
Ferro-chrome— 2/4% car. ..	£33	10	0
4/6% car. ..	£22	0	0
6/8% car. ..	£21	15	0
8/10% car. ..	£20	15	0
Ferro-chrome— Max. 2% car.	£37	2	6
Max. 1% car.	£43	10	0
Max.0.70%car.	£54	10	0
70%, carbonless	1/5½ lb.		
Nickel—99%, cubes or pellets ..	£170		
Cobalt metal—98/99%	10/– lb.		
Aluminium 98/99%	£118		
Metallic Chromium— 96/98% ..	3/3 lb.		
Ferro-manganese (net)— 76/80%, loose	£15	0	0
76/80%, packed	£16	0	0
76/80%, export	£14	5	0
Metallic manganese— 94/96%, carbonless	2/– lb.		

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten ..	s. d. 2 6
Finished bars, 18% tungsten ..	3 0

Per lb. net, d/d buyers' works.

Extras—
Rounds and squares 3 in. and over .. 4d.lb.
Rounds and squares under ½ in. to ¼ in. 3d. lb.
Do. under ¼in. to 1/16 in. .. .. 1/– lb.
Flats, ½in. × ¼in. to under 1 in. × ⅛ in. 3d. lb.
Do. under ½in. × ¼in. 1/– lb
Bevels of approved sizes and sections 6d. lb.
Bars cut to length 10% extra
Scrap from high-speed tool steel—
Scrap pieces .. .. 3d.
Turnings and swarf 1d.

Per lb. net, d/d steel makers' works.

SCRAP.

	£	s.	d.
South Wales— Hvy. steel	3	7	6
Bundled steel & shrngs.	3 3 0 to 3	6	0
Mixed iron & steel	3 0 0 to 3	3	0
Heavy cast iron	3	5	0
Good machinery for foundries ..	3	5	0
Cleveland— Heavy steel ..	3	1	0
Steel turnings ..	2	6	0
Cast iron borings	2	5	0
Heavy forge ..	4	2	6
Bushelled scrap	3	10	0
Cast-iron scrap	3	9	6
Lancashire— Cast-iron scrap	3 2 6 to 3	10	0
Hvy. wrought ..	3	2	6
Steel turnings ..	2	2	0

London — Merchants' buying prices delivered yard.

Copper (clean)..	48	0	0
Brass (clean) ..	38	0	0
Lead (less usual draft)	27	0	0
Tea lead ..	22	10	0
Zinc	22	10	0
New aluminium cuttings ..	80	0	0
Braziery copper	44	0	0
Gunmetal ..	45	0	0
Hollow pewter	180	0	0
Shaped black pewter ..	132	0	0

PIG-IRON.

(f.o.t. unless otherwise stated).

N.E. Coast—	
Foundry No. 1 ..	86/6
Foundry No. 3 ..	84/–
Foundry No. 4 ..	83/–
Forge No. 4	82/6
Hematite No. 1 ..	79/6
Hematite M/Nos. ..	79/–
N.W. Coast—	
Hem. M/Nos. d/d Glas.	86/6
,, d/d Birm.	95/9
Midlands—	
Staffs common* ..	—
,, No. 4 forge ..	—
,, No. 3 foundry	—
Shrops. basic	—
,, Cold blast, ord.*	—
,, ,, roll iron* ..	—
* d/d Birmingham.	
Northants forge	—
,, fdry No. 3 ..	82/6
Derbyshire forge ..	—
,, fdry. No. 3 ..	90/–
,, basic	—
Scotland—	
Foundry No. 1 ..	85/–
,, No. 3 ..	80/–
Hem. M/Nos.	78/–
Sheffield (d/d district)—	
Derby forge	—
,, fdry. No. 3 ..	—
Lincs. forge	—
,, fdry. No. 3 ..	—
E.C. hematite	91/–
W.C. hematite ..	89/–
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3.. ..	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	—
,, fdry. No. 3 ..	93/–
Northants foundry No. 3	—
Dalzell, No. 3	110/–
Summerlee, No. 3 ..	97/6
Glengarnock, No. 3 ..	97/6
Gartsherrie, No. 3 ..	97/6
Monkland No. 3	97/6
Coltness, No. 3	97/6
Shotts, No. 3	97/6

FINISHED IRON & STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

	£	s.	d.	£	s.	d.
Iron— Bars(cr.)	11 5 0	to	12	0	0	
Angles			11	10	0	
Tees to 3 united ins.			12	0	0	
Nut and bolt	10 5 0	to	10	7	6	
Hoops	14 0 0	to	15	0	0	
Marked bars (Staffs.) f.o.t. ..			14	0	0	
Gas strip			12	10	0	
Bolts and nuts ¾ in. × 4 in. ..			15	5	0	
Steel— Ship plates			8	2	6	
Boiler plts. ..			11	5	0	
Chequer plts. ..			10	0	0	
Angles			7	7	6	
Tees			8	7	6	
Joists			7	7	6	
Rounds and Squares 3 in. to 5½ ins. ..			8	0	0	
Rounds under 3 in. to ⅜ in.			7	15	0	
Flats, over 5 in. wide and up ..			8	10	0	
Flats, 5in. to 1½in.			7	10	0	
Rails, heavy ..			8	0	0	
Fishplates			12	0	0	
Hoops (Staffs.) ..			10	10	0	
Black sheets, 24g.			10	17	6	
Galv. cor. sheets, 24g.			16	5	0	
Galv. fencing wire 8g. plain			13	0	0	
Billets, soft ..			6	10	0	
Billets, hard ..			8	2	6	
Sheet bars			6	5	0	
Tin bars d/d ..			6	5	0	

PHOSPHOR BRONZE.

	Per lb.	basis.
Strip		1 3
Sheet to w.g.		1 3½
Wire		1 3½
Rods		1 3
Tubes		1 8
Castings		1 2

Delivery 3 cwt. free
10% phos. cop. £40 above B.S.
15% phos. cop. £50 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	Per lb.
Ingots for raising	9d. to 1/3
Rolled— To 9 in. wide	1/3 to 1/9
To 12 in. wide	1/3½ to 1/9½
To 15 in. wide	1/3½ to 1/9½
To 18 in. wide	1/4 to 1/10
To 21 in. wide	1/4½ to 1/10½
To 25 in. wide	1/5 to 1/11
Ingots for spoons and forks ..	9d. to 1/5½
Ingots rolled to spoon size ..	1/– to 1/8½
Wire round— 3/0 to 10 G.	1/6½ to 2/1½

with extras according to gauge.

AMERICAN IRON & STEEL.

At Pittsburgh unless otherwise stated.	Dollars.
No. 2X foundry, Phila.	22.76
No. 2 foundry, Valley	19.76
No. 2 foundry, Birm.	21.00
Basic	19.76
Bessemer	20.76
Malleable	19.76
Grey forge	19.26
Ferro-mang. 80% d/d	88.00
Bess. rails, h'y, at mill	43.00
O.-h. rails, h'y at mill	43.00
Bess billets	35.00
O.-h. billets	35.00
O.-h. sheet bars ..	36.00
Wire rods	45.00
	Cents.
Iron bars, Phila. ..	2.22
Steel bars	2.00
Tank plates	1.90
Beams, etc.	1.90
Skelp, grooved steel ..	1.90
Skelp, sheared steel ..	1.90
Steel hoops	2.50
Sheets, black, No. 28..	3.10
Sheets, galv., No. 28 ..	4.30
Sheets, blue an'l'd, 9 & 10	2.30
Wire nails	2.65
Plain wire	2.50
Barbed wire, galv. ..	3.35
Tinplate, 100 lb. box	$5.50

COKE (at ovens).

Welsh foundry	—
,, furnace	—
Durham & North.	
,, foundry	—
,, furnace	—
Other Districts, foundry	—
,, ,, furnace (basis)	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. Cokes,	20×14, box	23/–
,,	28×20, ,,	46/–
,,	20×10, ,,	—
,,	18¾×14, ,,	—
C.W.	20×14, ,,	22/–
,,	28×20, ,,	—
,,	20×10, ,,	—
,,	18¾×14, ,,	—

Terneplates 28×20, 37/– per box basis f.o.b.

SWEDISH IRON.

Bars,hammered	£18/10 to £19/0
Rolled Ord.	£15/15/0 to £16/5/0
Nail rods	£16 5 0 to £16 15 0
Keg. steel nom.	£33 to £35
Faggot steel nom.	£22 to £25
Blooms, according to quality	£9 to £12
Pig-iron	£6 5 0 to £7 0 0

all f.o.b. Gothenburg.

TUBES AND FITTINGS.

Up to and incl. 6 in.

	Tubes	*Fittings*
Gas ..	60%	.. 50%
Water ..	55%	.. 45%
Steam ..	50%	.. 40%

W.I. 10% extra.

DAILY FLUCTUATIONS.

Standard Copper (Cash).

	£	s.	d.	
June 24	56	15	0	inc. 12/6
,, 25	56	15	0	No change
,, 28	56	12	6	dec. 2/6
,, 29	57	0	0	inc. 7/6
,, 30	56	17	6	dec. 2/6

Electrolytic Copper.

	£	s.	d.	
June 24	64	10	0	dec. 5/-
,, 25	64	10	0	No change
,, 28	64	10	0	,, ,,
,, 29	64	15	0	inc. 5/-
,, 30	64	15	0	No change

Standard Tin (Cash).

	£	s.	d.	
June 24	272	15	0	dec. 20/-
,, 25	273	12	6	inc. 17/6
,, 28	272	0	0	dec. 32/6
,, 29	272	5	0	inc. 5/-
,, 30	272	0	0	dec. 5/-

Tin (English ingots).

	£	s.	d.	
June 24	270	5	0	dec. 35/-
,, 25	271	15	0	inc 30/-
,, 28	272	0	0	,, 5/-
,, 29	272	0	0	No change
,, 30	270	0	0	dec. 40/-

Zinc Sheets (English).

	£	s.	d.	
June 24	41	0	0	No change
,, 25	41	0	0	,, ,,
,, 28	41	0	0	,, ,,
,, 29	42	0	0	inc. 20/-
,, 30	42	0	0	No change

Spelter (ordinary).

	£	s.	d.	
June 24	33	13	9	inc. 5/-
,, 25	33	8	9	dec. 5/-
,, 28	33	3	9	,, 5/-
,, 29	33	12	6	inc. 8/9
,, 30	33	13	9	,, 1/3

Lead (English).

	£	s.	d.	
June 24	31	10	0	No change
,, 25	31	5	0	dec. 5/-
,, 28	31	5	0	No change
,, 29	31	10	0	inc. 5/-
,, 30	31	15	0	,, 5/-

AVERAGE PRICES OF STEEL RAILS.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Average.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1908	6 2 6	6 0 0	6 0 0	5 15 6	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 15 0	5 10 0	5 16 3
1909	5 5 0	5 5 0	5 5 0	5 0 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0	5 5 0
1910	5 5 0	5 7 6	5 7 6	5 7 6	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 10 0	5 8 11½
1911	5 15 0	5 15 0	5 15 0	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 12 6	5 13 1½
1912	5 13 1	5 15 0	5 15 0	5 15 7	6 1 6	6 6 3	6 7 6	6 8 0	6 11 3	6 12 6	6 12 6	6 13 9	6 4 4
1913	6 15 0	6 14 4½	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 12 6	6 10 0	6 10 0	6 10 0	6 10 9	6 12 0
1914	6 10 0	6 10 0	6 6 3	6 0 0	6 0 0	6 0 0	5 14 0	6 2 6	6 13 9	6 12 0	6 7 6	6 7 6	6 5 3½
1915	6 10 6	6 17 6	7 5 0	7 12 6	7 12 6	7 17 6	8 17 6	9 2 6	9 2 6	9 2 6	9 7 6	10 10 6	8 6 6½
1916	10 19 4	11 0 0	11 0 0	10 18 9	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 9 10
1917	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6
1918	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6	10 17 6
1919	10 17 6	13 7 6	13 7 6	13 7 6	15 0 0	15 10 0	16 0 0	16 10 0	16 10 0	16 10 0	16 10 0	17 5 0	14 12 11
1920	18 15 0	19 5 0	20 7 6	22 0 0	23 0 0	23 0 0	24 0 0	25 0 0	25 0 0	25 0 0	25 0 0	25 0 0	22 18 11½
1921	23 5 0	20 4 0	18 0 0	17 0 0	15 0 0	15 0 0	14 0 0	14 0 0	14 0 0	11 12 6	10 10 0	10 0 0	15 4 3
1922	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 10 0	9 0 0	8 15 0	8 15 0	8 15 0	8 15 0	9 4 2
1923	8 17 6	9 2 0	10 5 0	10 10 0	10 10 0	10 10 0	9 15 0	9 0 0	8 15 0	8 15 0	8 19 0	9 5 0	9 9 10
1924	9 5 0	9 5 0	9 5 0	9 5 0	9 5 0	9 2 6	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 0 0	9 2 3½
1925	9 0 0	9 0 0	9 0 0	9 0 0	8 15 0	8 10 7½	8 10 0	8 10 0	8 10 0	8 4 9	8 0 0	8 0 0	8 11 7½
1926	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	8 0 0	—	—	—	—	—	—	—

AVERAGE MONTHLY PRICES OF EAST COAST HEMATITE AT MIDDLESBROUGH.

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1915	83 11	88 6	94 8	107 0	102 6	101 3	98 9	98 7½	96 6	104 0	124 1	130 0	106 11½
1916	133 9	140 0	136 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	128 1½
1917	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6
1918	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6	122 6
1919	122 6	122 6	122 6	122 6	179 2	190 0	197 6	200 0	200 0	200 0	200 0	200 0	171 4
1920	220 0	220 0	240 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	260 0	251 8
1921	240 0	220 0	180 0	180 0	180 0	160 0	160 0	160 0	137 0	127 6	117 6	104 6	162 2
1922	97 6	91 7½	100 0	98 6	97 1½	94 7	93 6	90 9	89 7	91 10½	93 0	93 2	94 5½
1923	94 6	104 9	122 0	126 10½	122 0	115 3	107 0	98 8½	98 10½	99 1½	100 6½	102 3	107 10½
1924	102 4½	101 3	99 7½	99 0	98 9½	97 4½	95 3½	93 1½	90 7½	88 0	88 4½	88 6	95 2½
1925	87 5	85 9	84 7½	82 6	80 10½	79 3	77 1½	75 7½	75 0	74 3½	74 9	76 0	79 5½
1926	77 3	77 9	77 3½	76 3	77 4½	79 0	—	—	—	—	—	—	—

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18, BENNETTS HILL, BIRMINGHAM.
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ANGAPPA NAICK STREET, MADRAS.

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PIG IRON

SCOTCH, MIDDLESBRO', HEMATITE, BASIC, SPECIALS, &c.,

NON-FERROUS METALS

COPPER, TIN. LEAD, SPELTER, ANTIMONY, CHROME ORE

WILLIAM JACKS & COMPANY,

19, ST. VINCENT PLACE, GLASGOW.

ZETLAND ROAD, MIDDLESBROUGH.

XUM

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GENTLEMAN, with connection among Foundries on Tyneside and North of England, seeks position as Representative for Foundry Facings and Requisites or good Agencies.—Write, Box 744, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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MECHANICAL ENGINEER, 48, married, Public School, regular apprentice marine engineering, four years' draughtsman general engineers, 10 years' superintending engineer, rubber companies' experience, designing and erecting factories, etc., office work, special knowledge vacuum drying plant, rubber and vegetable products, requires post, Factory Engineer or Adviser and Consultant re machinery, etc., required for East. (1333)

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TO MALLEABLE AND GREY IRON FOUNDERS.

ADVERTISER wishes to obtain a FRESH AGENCY for London and District; has London Office, with connection, and experience extending over 25 years, representing an old-established and leading firm of Ironfounders; will be in a position to introduce business to a Foundry able to deliver good work at competitive prices.—Write, Box 763, SELLS, Fleet Street, E.C.4.

PROPERTY.

BUILDINGS and Premises suitable for Engineering trades, close to railway station and tram route, and within 1 mile of centre of Manchester, in industrial district. Foundry capacity 50 tons of Castings per week; frontage to barge canal; area of site 14,566 square yards; floor space of buildings 210,000 square feet; might be divided.—Apply, DUNLOP & COMPANY, Chartered Surveyors, 28, Brazennose Street, Manchester.

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PATENT YOUR INVENTIONS, Trade-mark your Goods. Advice, Handbook and Cons. free.—B. T. KING, C.I.M.E. (Regd. Pat. Agent, G.B., U.S.A., and Can.). 146a, Queen Victoria Street, E.C.4. 38 years' refs. 'Phone 682 Central.

THE Proprietors of the Patent No. 146,085 for Improvements in and connected with Pulverised Fuel Furnaces are desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring its full development and practical working in this country.—All communications should be addressed in the first instance to HASELTINE, LAKE & COMPANY, Chartered Patent Agents, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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FOR SALE.—20 in. x 20 in. x 8 in. Draw Mumford Pneumatic Swing-Head Press Split Pattern Jar Ramming Moulding Machine, complete with standard equipment; condition, brand new.—Offers to NEWMAN, HENDER & COMPANY, LIMITED, Woodchester, Glos.

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PLUMBAGO CRUCIBLES.—About 1,000 pots, from 20 lbs. to 400 lbs. capacity; excellent quality; must clear owing to storage difficulties; price, 1s. per 10 lbs. to consumers; special terms to stockists for £20 lots and over, with possible sole future agency for certain districts.—Box 762, Offices of THE FOUNDRY TRADE JOURNAL, 49, Wellington Street, Strand, London, W.C.2.

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